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JUN 8 1946

The OIL AND GAS JOURNAL

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and STRAIGHT HOLE

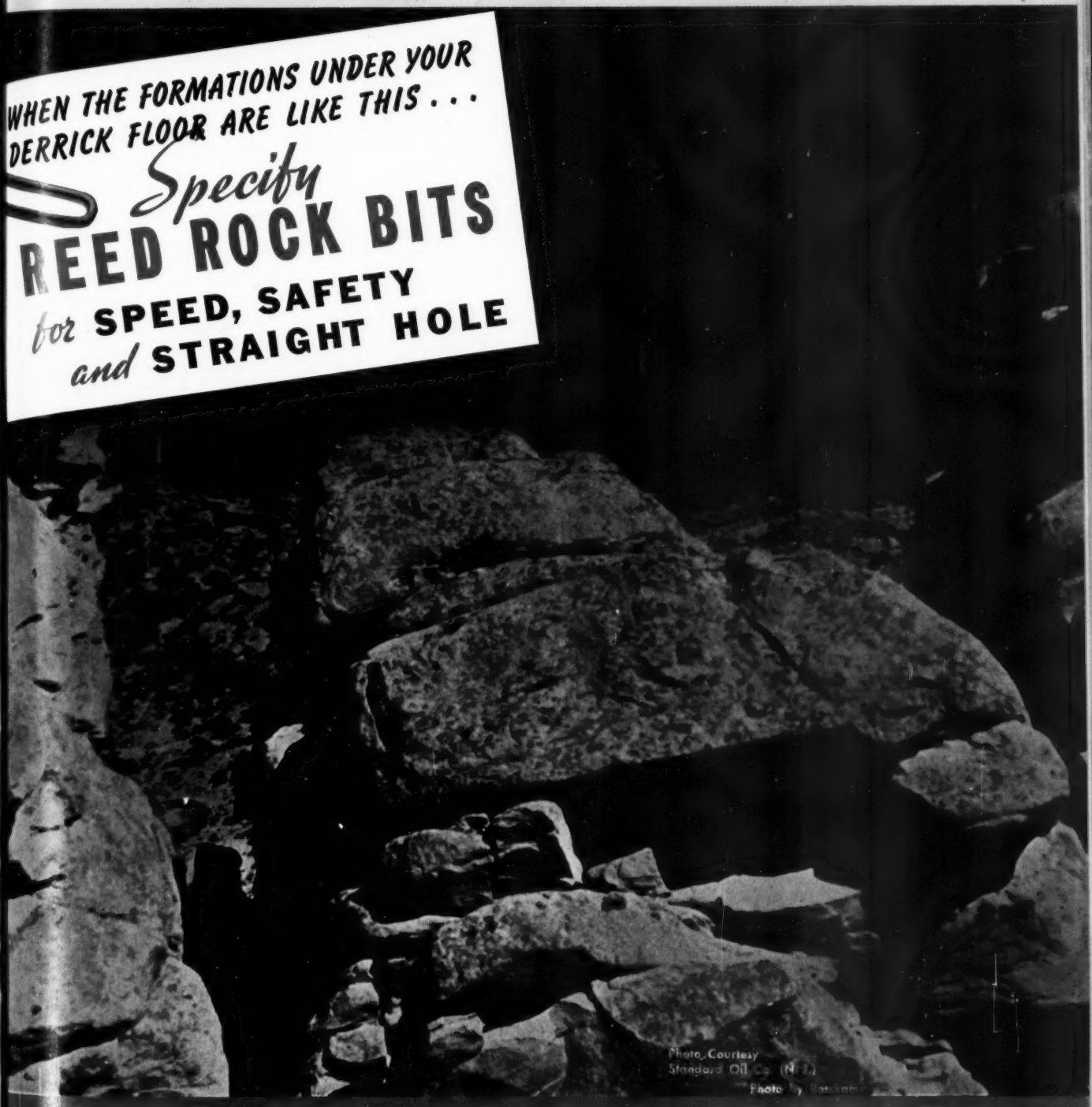

Photo Courtesy Standard Oil Co. (N. J.)
Photo by Ramsey

REED ROLLER BIT COMPANY

PRICE 20 CENTS

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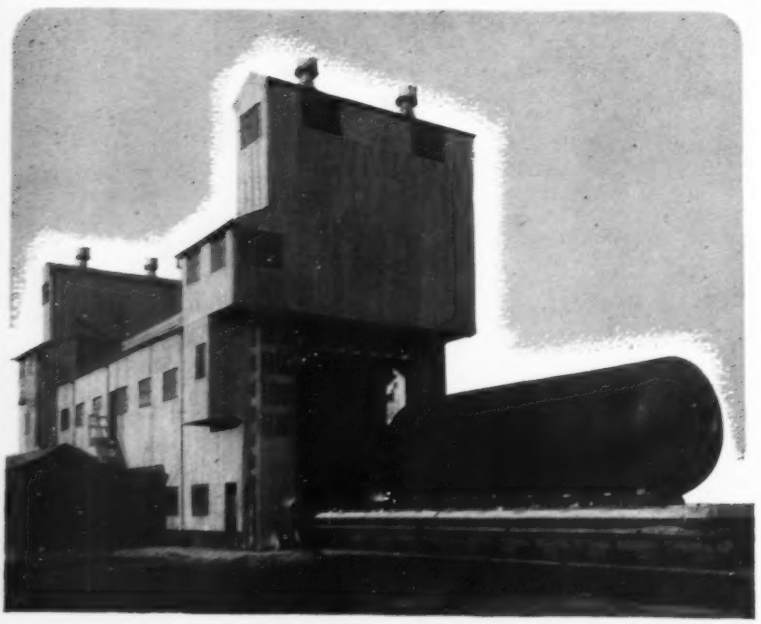
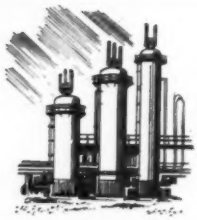
What's behind a pressure still?





. . . more than just steel plate work to be sure . . . in this case, ability to design, facilities to fabricate and erect and years of experience in furnishing welded steel pressure vessels for the petroleum industry.

We supplied the three pressure stills shown above to improve the efficiency of the absorption process and increase the throughput of gas at a petroleum company's absorption unit in Texas. The high pressure still is 49 ft. high by 11 ft. in diameter and has twelve trays. Its operating pressure is 185-200 lbs. per sq. in. The intermediate pressure still, which operates at 50-60 lbs. per sq. in. and is 12 ft. in diameter by 66 ft. high has eighteen trays. The low pressure still is 61 ft. high by 8 ft. in diameter and has twenty-four trays. Its working pressure is atmospheric to 5 lbs. per sq. in.

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The view at the left shows the new stress-relieving furnace at our Chicago plant. It handles vessels up to 13½ ft. in diam. by 83 ft. long. Longer vessels can be stress-relieved in two or more heats. We now have facilities for stress-relieving pressure vessels at all our plants.

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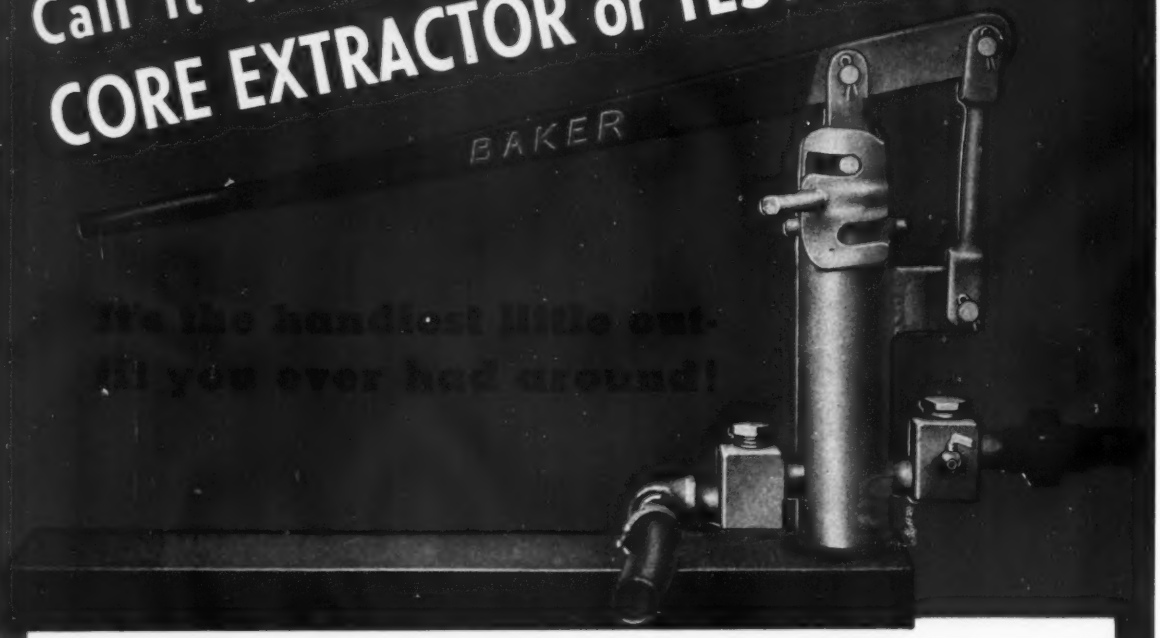
Call it what you like
CORE EXTRACTOR or TESTING PUMP



It has dozens of uses in both field and shop

The Baker Hydraulic Core Extractor and Testing Pump is a strong, simply constructed light-weight unit capable of developing pressures up to 6,000 pounds, without undue exertion.

Originally designed for removing cores from core barrels, many other oil field and shop uses have been discovered and it is today widely used as a testing pump; for removing plungers from insert liner oil well pumps; for testing valves, fittings, casing and tubing; and for setting Baker Cement Retainers when mud or cement pumps are not available.

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The Baker Hydraulic Core Extractor and Testing Pump is identified as Product No. 540, and is described in detail on Page 374 of the 1944 Baker (or Composite) Catalog.

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Houston—LOS ANGELES—New York

The BAKER Hydraulic

CORE EXTRACTOR AND TESTING PUMP • PRODUCT NO. 540

THE OIL AND GAS JOURNAL

Recovering Reserves

A READER says that he is confused. His own observations support the statements of those who contend that new field discoveries in this country are not keeping pace with the current production of crude oil. Yet proven reserves are being maintained around 21 billion barrels and a peak or near peak in daily domestic output is in prospect for this month.

In partial answer to this query we have called attention to the engineering and operating discussions which have appeared in this publication in recent months including news reports and papers presented at recent A.P.I., A.I.M.E., and other technical meetings dealing with the recovery of oil in place. Recovery arts which were largely theory or nonexistent a few years ago have been established as commercial operations and technologists with the "know how" are indicating what is to be expected in the future.

Improved practices include practically every method that has ever been used in bringing liquid petroleum to the surface from the producing horizons—flowing, pumping, pressure maintenance, repressuring, and the various types of secondary recovery. These have been tied in to improved equipment and supplementary operations with unitization of fields.

The net result is that the ultimate recovery of old and new fields has been greatly increased. Because of this development many pools today with practically the same producing areas have greater recoverable reserves than they had 5 to 10 years ago.

Paralleling in importance these more efficient crude-oil production applications, as reflected in the literature of the oil industry since the war's close, has been the rapid expansion of cycling and allied activities. In these combination field and plant operations condensate and gases are being recovered on a basis competitive with crude-oil fields and have already added hundreds of millions of barrels to our available petroleum.

Outstanding as have been the improvements in recovery methods our technologists are in agreement that the next decade will bring still greater achievements provided operators are encouraged to carry on to their logical ends old and new operating procedures, some of which are in their infancy so far as their potential uses are concerned. What has been done so far has had little or no encouragement as regards price despite generally higher operating costs.

So our recovery engineers are in effect stretching out our petroleum supplies after they have been discovered by explorationists and drillers. Their combined accomplishments explain why operators in this country are now producing in excess of 5 million barrels daily of liquid petroleum in response to unexpected peacetime requirements minus the shortages of products common to every other major industry.

Amendments to Leasing Act Are Approved by Senate Committee

by Henry D. Ralph

WASHINGTON. — Amendments to the mineral leasing act compromising the views of the oil industry and the Interior Department have been approved by the Senate committee on public lands.

The committee reported out the Hatch-O'Mahoney bill (S. 1236) in an entirely rewritten form, using as a basis the draft suggested by Interior rather than the original bill on which hearings were held. However, the Department's draft was changed in a number of respects to meet criticisms of industry witnesses.

"The bill," says the committee's report, "is designed to stimulate the discovery of new petroleum reserves; to promote the development of oil and gas on the some 300,000 square miles of potential oil lands of the public domain; to grant incentives which will bear as their rewards American leadership in industry and world affairs."

The principal provisions of the bill are to increase acreage limitations and to fix a flat royalty of 12½ per cent on proved structures.

Public lands within a known geological structure of a producing oil or gas field are to be leased competitively at a royalty rate of not less than 12½ per cent, but wildcat acreage is to be leased to the first applicant at a flat 12½ per cent. All leases are for a primary term of 5 years and continue thereafter for so long as oil or gas is produced in paying quantities. The existing rental of not less than 25 cents per acre per year, with the second and third years' rentals being waived prior to discovery, is maintained, but a minimum royalty of $1 per acre per year after discovery is substituted for the existing advance rental. With certain exceptions, the leases are subject to one renewal for 5 years, and if not subject to renewal are extended for 2 years if diligent operations are in progress at the lease expiration date.

The new bill abolishes the old acreage limitation on a single structure, and doubles (to 15,360) the number of acres which may be leased in any one state by a single person or corporation. Furthermore, the word "association" has been defined to exclude mere operating contracts and tenancies in common, to the end that each party to such a contract, and each tenant in common, will be charged with but his percentage of the acreage in the lease rather than the entire acreage. The bill also permits nonrenewable 2-year options for geological or geophysical examinations of prospective areas, limited to 100,000 acres in one state at one time.

Provisions of the law relating to unit operations have been consolidated and rewritten, including a provision permitting unitization of a part of a single pool.

Much of the delay and uncertainty connected with assignment of leases is eliminated by a new provision permitting an assignment to take effect after filing but requiring the assignor to be responsible for the performance of the lease contract until the assignee has filed bond and been found qualified by the Interior Department.

Elk Basin Unitization Plan Gets Nod From Interior

THE Department of Interior has approved the unitization plan presented by operators in Elk Basin field, according to an announcement from Washington. The Elk Basin field, lying across the Wyoming-Montana state line, but mostly in Wyoming, is one of the largest in the Rocky Mountain region, currently producing around 16,000 bbl. per day.

The action of the federal Government climaxes almost 2 years of effort and planning by the operators in the field and was the final major legal hurdle. Stanolind Oil & Gas Co. will operate the unit, with Carter Oil Co., Continental Oil Co., MacKinnie Oil & Drilling Co., Ohio Oil Co., Phillips Petroleum Co., Sinclair-Prairie Oil Co., and a large number of individuals as the other partners.

The area within the unit agreement comprises 5,827 acres, most of it on government land, on which there are 128 wells, each producing 125 bbl. daily. The main producing horizon is the Tensleep sand of Pennsylvanian age, which averages about 200 ft. thick, and has about 2,000 ft. of closure above the water table. While the unitization agreement affects principally the Tensleep, it also unitizes any deeper production that may be developed in the future.

The present reservoir pressure is around 1,200 psi., but the plans under consideration contemplate building this up to about 1,300 psi. by the construction of a pressure-maintenance plant capable of injecting about 14,000,000 cu. ft. of gas daily into the reservoir with a delivered pressure of about 1,500 psi. at the injection-well casinghead. It is believed that the 1,300 psi. reservoir pressure can be maintained even if the production is increased to 25,000 bbl. per day from the present level of 16,000 bbl. The higher production rate would, of course, be contingent on a market outlet for that volume.

The high sulfur content of the gas produced with the oil, 18 per cent H_2S, has resulted in some very unusual features in the plans which the operators are considering. All gas will be treated for removal of H_2S and CO_2. The fractions removed will then be processed, and sulfur recovered as a by-product in a special unit.

The sweetened gas will go to a 10-12,000,000-cu. ft. daily capacity gasoline plant, where all liquefied fractions will be removed, and the dry residue gas made available for other operations. Part of this residue gas will be available for the market; part will probably be used to operate compressors, and about 1,500,000 cu. ft. per day will be burned under boilers in the power plant.

The boilers will have specially designed combustion chambers, from which the flue gases will be drawn off. The flue gases resulting from the burning of 1,500,000 cu. ft. of gas and a much larger volume of air, will consist of a mixture of nitrogen, carbon dioxide, and there will be roughly 10 times as much volume available as the amount of methane gas burned.

About 14,000,000 cu. ft. of flue gases daily will be drawn off to the compressor plant stepped up in pressure, and delivered to the injection wells at about 1,500 psi.

Gasoline Plant Opens

Northern Natural Gas Co. this week began operations at a new natural-gasoline plant near Sublette, Kans. The plant will produce between 30,000 and 40,000 gal. per day of natural gasoline. Production will be handled under contract by Warren Petroleum Corp.

WAA Proceeding Cautiously in Disposing of Big-Inch Lines

WASHINGTON. — War Assets Administration is taking more cautious preliminary steps toward disposal of the two big-inch pipe lines.

Reports here say the agency will readvertise for bids sometime this month, setting a closing date for offers probably early in July. The lines were advertised last year. The war emergency lines are now being maintained in a standby condition.

WAA is said to be considering seriously use of the big-inch line for natural gas, and the little big-inch for oil. The big-inch extends 1,340 miles from Longview, Tex., to the New York-Philadelphia area; has a capacity of 300,000 bbl. daily, and cost $78,000,000. The little big-inch extends 1,475 miles from the Texas Gulf Coast to the New York area; has a capacity of 235,000 bbl. of gasoline daily, and cost $67,300,000.

Developments in the disposal of the lines are being closely followed by industry. Coal and railroad groups are opposing conversion of the carriers to gas, fearing further invasion of their markets. Some segments of the oil industry are fighting plans under which the lines would be used for products transmission.

Clause Causing Difficulty

Regarded as one difficulty insofar as natural gas is concerned, is a clause in more than 200 water-crossing agreements which limits use of the lines to transportation of petroleum products. Some officials feel these agreements will have to be rewritten if the line is used for natural gas.

February 11, WAA sent out an inquiry to some 5,000 oil operators asking expression of interests in buying the lines, their operation as common carriers, or participation in joint purchase. In March, Transcontinental Gas Pipe Line Co., Inc., a newly organized Texas company, offered WAA $40,000,000 for the lines, excluding pump stations. The application was made to the Federal Power Commission which was asked to approve conversion of the lines to gas, and if the company was not successful in making the purchase, to authorize construction of an $80,000,000 gas line from Texas to the New York area. Later in March, two other new companies, Big Inch Gas, Inc., and Big Inch Oil, Inc., offered $40,000,000 for the big-inch for use in gas transmission and at the same time proposed to buy the little big-inch for movement of crude and products.

FPC, however, has indicated it will make no move in the cases until WAA acts on disposal. FPC announced April 27 was the deadline for filing protests against the application of Big Inch, Inc., but said no hearings will be held on the applications until one or both of the lines are sold for gas purposes.

Besides the two governmental agencies, however, Congress also is taking a hand in the disposal problem. WAA officials concede that they would hesitate to close a sale without assurances from Congress that it does not wish to study the question further. Senator O'Mahoney has said his committee investigating petroleum resources will hold further joint public hearings on the disposal problem.

Stripper Payment Boosted For Eight More Pools

WASHINGTON. — Eight additional pools in five states have been allowed an increase by the Office of Price Administration in stripper-well payment. The increase, retroactive to May 1, 1946, affects the following: Playa Del Rey field, California, 14 cents; Elbing, Greenwich, and Lost Springs, Kansas, 9, 25 and 20 cents, respectively; Polkton field, Michigan, 35 cents; Chandler and Moore fields, Oklahoma, 4 cents; and Talco field, Texas, 14 cents.

Oil Librarians to Meet

BOSTON, Mass.—Technical librarians and literature chemists from petroleum producing, refining, and engineering companies throughout the country will meet at the thirty-seventh annual convention of the Special Libraries Association, to be held at the Hotel Statler here June 13-15. Mrs. Miriam T. Friend, librarian of M. W. Kellogg Co., is chairman of the petroleum group.

Eastern A.P.I. Meeting at Pittsburgh

PITTSBURGH, Pa.—Thirteen discussions, mostly technical papers on drilling techniques and secondary recovery but also including several subjects of general interest to the oil industry, are scheduled on the program at the spring meeting of the eastern district, American Petroleum Institute's Division of Production, at Hotel William Penn here June 13-14.

V. F. BOWYER

A banquet and entertainment is scheduled for the evening of June 13. The business session, with Virgil F. Bowyer, Peoples Natural Gas Co., district chairman presiding, will be held the morning of June 14. Officers will be elected at the meeting.

The program as announced by S. M. Vockel, Waverly Oil Works Co., chairman of the publicity committee, follows:

Morning session, 9:30, Thursday, June 13, Bowyer presiding: "Federal Power Commission Hearings in the Natural Gas Industry," E. Holley Poe & Associates; "Problems We Face Today," Walter S. Hallanan, president, Plymouth Oil Co.; and a motion picture showing construction of the Tennessee Gas & Transmission line, presented by the Chicago Corp.

Afternoon session, 2 p.m., Kurt H. Andresen, South Penn Oil Co., presiding: "Design and Construction of Water Pumping Plants," George W. Holbrook, vice president, Empire Gas & Fuel Co., Ltd.; "Source and Purification of Water Supply," A. R. Ellenberger, Smith-Newton Oil Co. laboratory and George W. Holbrook; "Gas Requirements in Gas Drive Recovery," R. J. Day, assistant professor and Dr. S. T. Yuster, associate professor, both of Pennsylvania State College; and "Gas Recovery Systems," Douglas Rogers, Jr., geologist, South Penn Natural Gas Co.

Morning session, 9:30, Friday, June 14, R. B. Anderson, assistant superintendent, Columbia Carbon Co., presiding: "Oil and Gas Possibilities in the Appalachian Region With Emphasis on the State of New York," Dr. E. T. Heck, geologist, New York State Museum; "Safety in the Oil and Gas Fields," Paul Walton, chief engineer, Industrial Gas Corp.; and "Oil Economics," H. M. McClure, independent producer, Alma, Mich.

Afternoon session, 2 p.m., Gordon Gully, geologist, Gulf Oil Corp., presiding: "Marble Shooting," J. Gordon Burch, Burch Agate Torpedo; "Reconditioning of Drowned Gas Wells," Dr. Yuster; "Deep Rotary Drilling in the Appalachian Region," Bruce Miller, drilling superintendent, Ohio Oil Co.; and "Deep Cable-Tool Drilling in the Appalachian Region," Harold W. Haupt, vice president, Acme Drilling Co.

OPA Increases Ceiling Prices On Oil Equipment 10 Per Cent

WASHINGTON.—Ceiling prices on oil-field equipment have been increased 10 per cent by an order of Office of Price Administration effective May 31.

The increase is to be calculated on the base prices as frozen in 1941 and 1942, not including individual price increases which have since been granted to certain manufacturers. Supply houses and other resellers may increase their prices by the percentage which their net invoiced cost has been increased as a result of this order.

OPA said that an industry-wide cost survey should be made in the near future, but granted this interim price increase to cover higher costs of materials and manufacturing and because similar increases have been found justified in the prices of other types of industrial equipment.

The increase applies to exploration and geophysical equipment; cable and rotary surface and subsurface equipment (except bits, reamers, and coring equipment); cementing equipment; derricks and substructures; well surveying, logging, sampling, mud-testing and directional-drilling equipment; well-servicing and gun-perforating machinery; surface and subsurface production equipment for both flowing and pumping wells; and treating and storage equipment but not including field-erected storage tanks, pipe, pipe fittings, nor oil-country steel tubular equipment. The increase does not include auxiliary equipment when sold separately unless designed specifically for and useable only with the listed items. Water-well drilling equipment is also included in the price increase.

The increase, said OPA's announcement, "is necessary to relieve many manufacturers from hardship resulting from increased materials and wage costs since 1941.

"It is based on a study of recent individual company applications for increases in maximum prices to cover higher manufacturing costs and will provide only the minimum amount required to relieve hardship. A further study to determine the need of another adjustment may be needed later after additional data and figures have been obtained."

The increase is the same as was granted previously to the manufacturers of construction equipment, which OPA said is the nearest comparable industry. The increase for oil-field equipment came in Order No. 638 to Revised Maximum Price Regulation 136.

Committee Protesting Order

A. W. McKinney, chairman of the OPA industry advisory committee for manufacturers, wired the Petroleum Equipment Suppliers Association of the action by OPA. He said the list of products included was "substantially as presented by our advisory committee with the exception we have already found bolted tanks have been eliminated due to the fact that these are under the metal processing branch." McKinney said the group is protesting vigorously and fears that the order may include some additional items that conflict in other branches.

Auto Travel Within 1.6 Per Cent Of 1941 All-Time High

WASHINGTON.—Some explanation of the surprisingly high current gasoline consumption is found in figures on highway use which were made available this week by the Public Roads Administration.

Throughout the nation, the volume of traffic on the nation's highways during April of this year was within 1.6 per cent of that in 1941, according to reports received by the administration from state authorities.

Figures for April showed that the upsurge in highway travel was greatest in the western states, where a 21 per cent increase over traffic volumes in the corresponding 1941 period was reported. Traffic volumes in the midwest states during April were 4.2 per cent below 1941 levels, and in the eastern states, 10 per cent below.

In comparison with figures for April 1945, traffic in the western states increased 63 per cent; in the central states, 48 per cent, and in the eastern states, 51 per cent.

Registration of private and commercial motor vehicles in 1945 totaled 30,606,859 as compared with a total of 30,086,189 in 1944, an increase of 520,670 or 1.7 per cent. Registrations of publicly owned vehicles rose from 393,117 in 1944 to 396,991 in 1945. Trailers and motorcycles are not included in the above figures.

Truck registrations last year totaled 4,830,458, against 4,513,340 in 1944, an increase of 317,118. The number of privately owned automobiles and taxicabs registered in 1945 was 25,664,524, an increase of 198,193 over 1944 registrations. Apparently, many cars were brought out of storage, as the number of new cars reaching private users does not account for the increase, the federal agency said.

License Receipts Up

State motor-vehicle receipts last year, including registration fees and miscellaneous collections, amounted to $440,341,000, as compared with total receipts of $419,479,000 in 1944. Registration fees amounted to $385,694,000, an increase of $12,544,000 over 1944 registration receipts.

Highway vehicles during 1945 consumed 19,339,492,000 gal. of gasoline, an increase of about 16 per cent over 1944, PRA said.

Another report of booming automobile travel came from Austin, Tex. State officials reported tax-paid sales of gasoline in Texas reached a new high in April. Distributors sold 158,710,544 gal. to nongovernment users during the month, and the tentative compilation of taxes paid totaled $6,347,554, an all-time high.

Meanwhile, the Civilian Production Administration here said the 1946 production schedule for passenger-car tires will be increased 3,150,000 units to help meet unprecedented demand, while schedules for other types of tires in more ample supply will be revised downward. The new goal for passenger-car tires was set at 69,150,000 units.

Shell Enlarging Staff In South Louisiana

LAKE CHARLES, La.—In preparation for increasing its division office staff here, Shell Oil Co., Inc., has arranged for the construction of a two-story office building adjacent to the building it is now occupying.

About 10 employes are moving to Lake Charles from Houston, and a staff of 40 employes will direct all exploration and production activities in South Louisiana. An exploration department and a land-survey section will be established in addition to the present production department organization. E. N. Van Duzee, division manager, will continue to head the production department.

THIS 1946 WEEK

PRICES—OPA extension bill due to reach floor of Senate this week. . . . Indications point to provision which would provide automatic decontrol for oil. . . . I.P.A.A. report, however, says authority of proposed decontrol board is so confused it is doubtful any controls could be removed. . . . ¶OPA authorizes 10 per cent hike in ceilings for oil-field equipment. . . . Further study planned to determine need for second adjustment. . . . ¶Price control suspended on charges of contract water carriers. Action affects principally petroleum. . . . ¶Heavy demand pushes both gasoline and natural gasoline to higher levels. . . .

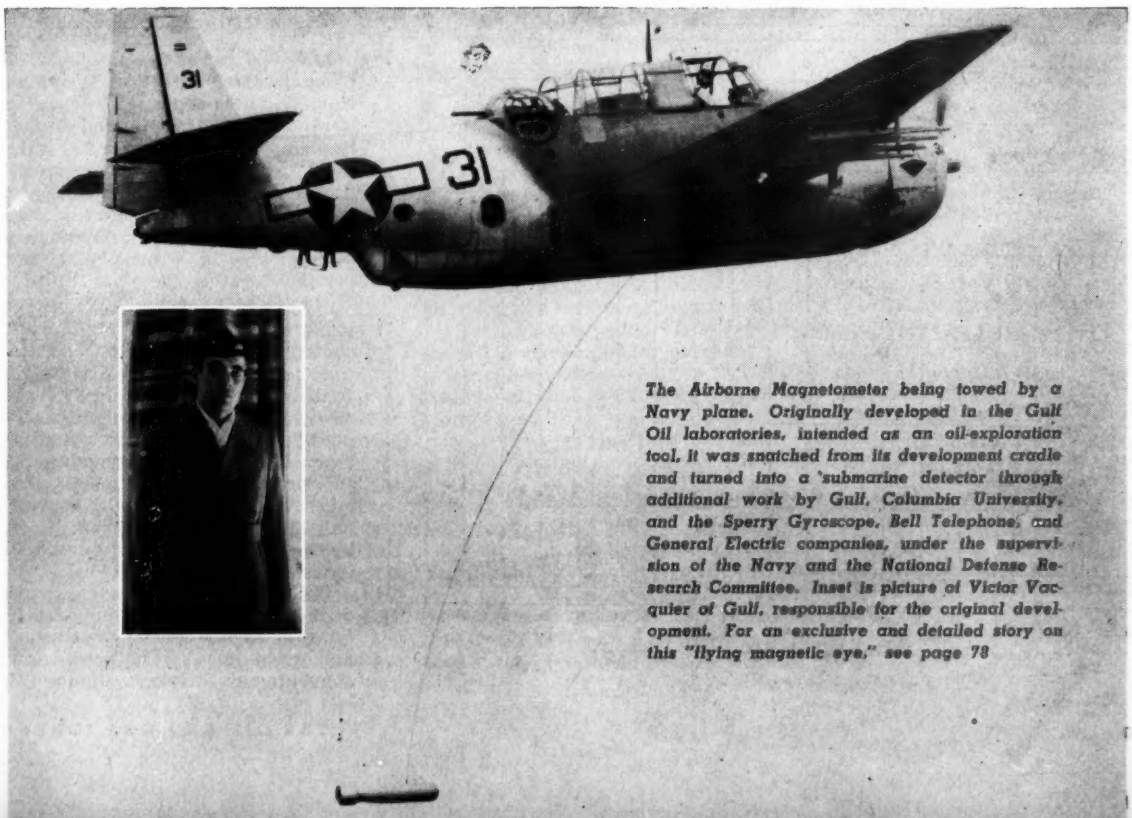
REFINING—Lead outlook brightens. . . . Increase of 1 3/4 cents per pound in prices. . . . No decision yet made on whether users will absorb increase. . . . State Department reported under heavy pressure to alter U. S.-British agreement limiting American purchases in world markets. . . . C.P.A. abandons specific monthly allocations. . . . Promises sufficient lead to meet demand under use limitation order. . . . ¶Indiana Standard reports materials restrictions causing difficulties for $150,000,000 construction program. . . . One catalytic cracking unit at Whiting nearly complete. . . . ¶Crude runs rise to 4,857,000 bbl. daily—highest since immediately following end of war. . . .

INTERNATIONAL—Agreement reported in Venezuelan labor negotiations. . . . Ends strike threats. . . . Contract reported runs for 19 months, grants workers wage raise of 2 bolivares (60 cents) daily. . . . ¶Iranian strikers return to work following walkout reportedly supported by Communist leader. . . . Workers to submit demands to Government arbitration commission. . . . ¶Agreement reported reached between Arabian American Oil and Trans-Jordan Government for construction of pipe line. . . .

LEGISLATION—Senate committee reports public lands leasing bill. . . . Measure provides for flat 12 1/2 per cent royalty on unimproved structures, doubles holdings allowed in any one state. . . . Reaction from industry generally favorable. . . . Rocky Mountain Oil & Gas Association calls for passage by both branches before adjournment so that operators can formulate 1947 plans. . . . ¶House ways and means committee schedules hearings later on taxation of co-ops. . . .

REGULATION—Davies studies suggestions for membership on National Petroleum Council. . . . Expresses satisfaction with attorney-general's letter clearing council's formation but withholds release of correspondence until further check of nominations for membership. . . . Budget Bureau submit request for $472,000 for OGD for fiscal year ending in 1947. . . . ¶Interstate Oil Compact Commission studies I.P.A.A. proposal for creation of national and district advisory committees for the commission. . . .

PRODUCTION—Department of Interior approves unitization plan for Elk Basin. . . . Action culminates 2 years of planning and effort. . . . Pool now making about 16,000 bbl. daily. . . . ¶Production of gasoline during week ended May 25 increases 124,000 bbl. to 14,322,000 bbl. . . . ¶Heavy fuel-oil production rises sharply to reach 8,908,000 bbl. during week, an increase of 488,000 bbl. . . .



The Airborne Magnetometer being towed by a Navy plane. Originally developed in the Gulf Oil laboratories, intended as an oil-exploration tool, it was snatched from its development cradle and turned into a 'submarine detector through additional work by Gulf, Columbia University, and the Sperry Gyroscope, Bell Telephone, and General Electric companies, under the supervision of the Navy and the National Defense Research Committee. Inset is picture of Victor Vacquier of Gulf, responsible for the original development. For an exclusive and detailed story on this "flying magnetic eye," see page 78

The Picture for Liquefied Petroleum Gases

by G. G. Oberfell and R. W. Thomas

DURING the war large quantities of light hydrocarbons were used in the production of war materials. To fully appreciate the present supply and demand picture of liquefied petroleum it is necessary to briefly consider the production and consumption of these products during this period. Large quantities of LPG were required in the manufacture of 100 octane gasoline and synthetic rubber components. The production of this aviation gasoline increased from a few thousand gallons per day before the war to over 20,000,000 gal. per day at the close of the war. Likewise the production of synthetic rubber which was only minor prior to the war reached approximately 800,000 long tons during 1945.

Since approximately one-third of the aviation gasoline was produced from LPG, large quantities of these light hydrocarbon gases were required for this purpose. The peak production of aviation gasoline consumed almost 9,000,000 gal. per day or about three times the average quantity of LPG used by our industry in 1945. A large amount of this LPG was obtained from thermal and catalytic cracking operations used in the refining of crude oil.

In the case of synthetic-rubber components approximately 50 per cent were produced in 1945 from petroleum products. The two main components were butadiene and styrene, both of which are partially produced from LPG. It is estimated that during 1945, well over 1,000,000 gal. per day, a quantity of LPG equal to over one-third of the average 1945 daily demand for all purposes of the LPG industry, was used in the production of synthetic rubber components. This demand for these light hydrocarbons has not decreased with the cessation of hostilities but rather has increased and it is expected that this demand will continue for several years to come.

The authors are vice president in charge of research and manager of research and development, respectively, for Phillips Petroleum Co. This article is from their paper presented at the recent annual meeting of the Liquefied Petroleum Gas Association at Colorado Springs, Colo.

The sale of any material is with few exceptions to that market where it will command the greatest profit; LPG is no exception to this rule. When LPG was introduced in sizable quantities it was more or less a secondary product, its production cost being its fuel value plus the cost of separating and purifying it. Today however, conditions have changed greatly. Instead of being used only for fuel purposes, LPG is being demanded in large quantities by several other markets which command prices higher than the LPG market.

Some of the most important markets in which LPG is used in large quantities are: motor gasoline blending, refining processes (polymerization, alkylation, etc.), synthetic rubber components, chemicals, carbon black, and plant fuel.

Sizable quantities of butane have been and will continue to be used for the synthesis of motor gasoline. If an octane number race takes place in the marketing of motor gasoline, it is possible that a number of alkylation units will be operated in order to produce high-octane number gasoline. The refinery alkylation unit is a means whereby isobutane and C_3, C_4 and/or C_5 olefins are converted chemically into a high quality motor or aviation fuel ingredient. It is rather difficult to estimate what the demand for C_4 hydrocarbons would be for this purpose. It is possible that between 2,000,000 and 4,000,000 gal. per day of C_4's will be required for the postwar program of synthesizing motor fuel and aviation ingredients.

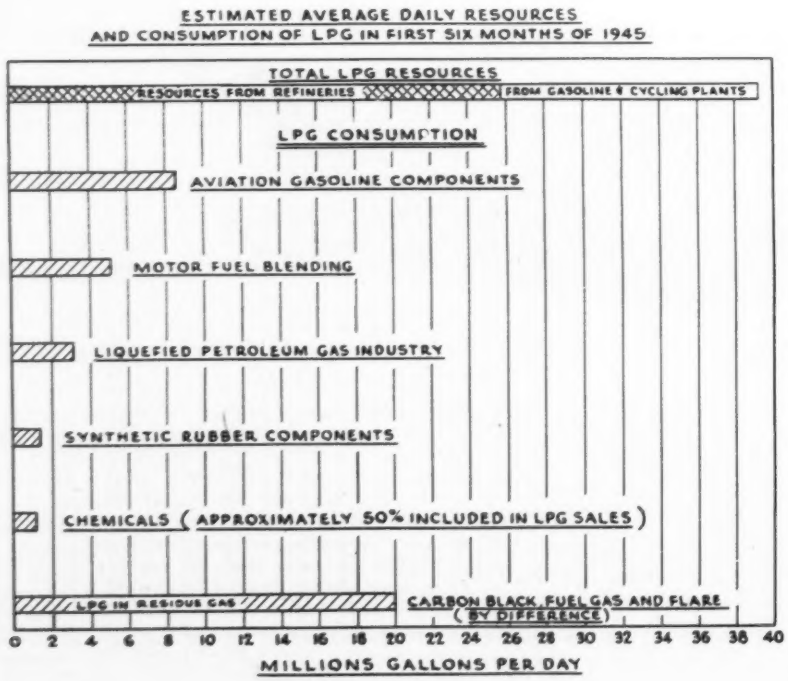

ESTIMATED AVERAGE DAILY RESOURCES
AND CONSUMPTION OF LPG IN FIRST SIX MONTHS OF 1945
TOTAL LPG RESOURCES
RESOURCES FROM REFINERIES
FROM GASOLINE & CYCLING PLANTS
LPG CONSUMPTION
AVIATION GASOLINE COMPONENTS
MOTOR FUEL BLENDING
LIQUEFIED PETROLEUM GAS INDUSTRY
SYNTHETIC RUBBER COMPONENTS
CHEMICALS (APPROXIMATELY 50% INCLUDED IN LPG SALES)
LPG IN RESIDUE GAS
CARBON BLACK, FUEL GAS AND FLARE
(BY DIFFERENCE)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
MILLIONS GALLONS PER DAY

Fig. 1

Synthetic-Rubber Components

It is not expected that the C_4 demand in the production of synthetic rubber components will cease for some time. It is estimated to be in the neighborhood of 700,000 gal. of C_4 hydrocarbons per day. Propane is used extensively as a starting product for the production of ethylene for synthesis of styrene and may continue at about the rate of 700,000 gal. per day.

Light hydrocarbons, especially propane, are used in the production of chemicals. The more desirable olefinic feed stock as a rule is obtained from refineries, resulting in many new chemical plants being located adjacent to refineries. The quantity of light hydrocarbons being used for the production of chemicals is increasing steadily but still represents only 20 to 50 per cent of the light hydrocarbons consumed by the LPG industry.

With the large wartime expansion of the synthetic-rubber industry, new types of carbon blacks were required and great increase in production of conventional blacks, coupled with

some modification of their properties, was necessary. Carbon black is very essential to the manufacture of auto and truck tires. The introduction of butane and propane in residue gas going to existing plants increased the carbon black production. Since many carbon - black natural - gas contracts require a minimum B.t.u. or minimum carbon-black yield per cubic foot of residue gas burned, butane and propane cannot be extracted beyond a certain point.

It was estimated that during the war the average annual resources of C_3 and C_4 hydrocarbons were more than 10 times the total 1945 consumption of the LPG industry. When it is realized that the consumption of the LPG industry increased tenfold in the last 10 years (1936—106,652,000 and 1945—1,100,000,000 gal.) it is readily apparent that the LPG industry will have to grow enormously before it makes noticeable inroads into the potential LPG reserves. In fact, it hasn't made a dent yet. It should be remembered that a large amount of the potential LPG will have to be separated from existing streams and treated in order to produce a product which will meet purchase specifications. This additional separation and treatment would increase the cost of this added volume to a point where it will not be possible to obtain it at the current LPG prices. This will have a tendency to cause a gradual increase in average cost of LPG. This increase is expected to continue until the price of motor fuel has been reached, particularly with respect to butane.

One of the sources of supply which is rapidly growing is from cycling plants. Also a number of new natural-gasoline plants are being erected. The main disadvantage with natural-gasoline plants is that frequently their LPG production is so small that it is difficult to justify the installation of the necessary separation equipment. In the case of cycling plants, however the volume is large enough that LPG manufacturing facilities can be justified. Because of the place advantage of LPG produced at the point of use, all needed refinery LPG is used to meet the local demands of the refiner before securing shipments from natural gasoline or cycling plants. Some refineries will have an excess over their own requirements, and this material is potentially available to the LPG industry at a price.

A recent development which enters the future LPG supply picture is the so-called Fischer-Tropsch process, or variations thereof, which use natural gas as raw material for the production of heavier hydrocarbons. The production of motor gasoline and other petroleum products by this method may yield sizable quantities of butane and propane. Therefore installations of this process for the production of petroleum products are not expected to diminish the over-all supply of LPG.

The requirements of industries competing for propane and butane and the large volume sales of the LPG industry itself have created problems of production, transportation, and storage. The producer or producer-marketer and the distributor or direct user because of these mutual problems are more closely associated than ever before. Liquefied petroleum gas is now a coproduct and not a byproduct in most producing plants. Cost of butane and propane production has steadily increased. Since the production of LPG is a continuous operation, sale of liquefied petroleum gas must be made on a regular basis with almost constant daily shipments. Failure to move the products as they are produced can only result in increased cost. Meeting the industry's peak demands at present price levels is becoming increasingly more difficult for producers, transporters and marketers.

Transportation, that all-important link between the producer and the distributor or user has become a very important factor in the industry. At the present time there are approximately $17,000,000 invested in the special tank cars required to transport butane and propane, exclusive of the pressure cars in butadiene and chemical services, and exclusive of the millions of dollars invested in LPG transport and tank trucks. Based on the present efficiency of movement of cars, an average investment of approximately $5,000 in tank cars is required to deliver one car per month to a distributor or user.

Possibilities for increasing summer activities include flame cultivation, weed burning, farm - product dehydration and motor fuel use in farm tractors and irrigation power units. Flame cultivation of cotton, sugar cane, and other row crops will consume large volumes of propane and butane during 1946 and this use will undoubtedly expand many times during 1947 and 1948. Considerable research and development work has already been carried out by the LPG industry with manufacturers of farm tractors and power units to provide prime movers factory equipped for efficient, economical use of butane and propane; 1947 should see several thousand factory-equipped liquefied petroleum gas units in operation. Dehydration of alfalfa, sweet potatoes, and other farm products will require large volumes of LPG in future years.

International Petroleum Exposition Is Postponed Until 1948

THE twelfth International Petroleum Exposition, originally scheduled to be held in Tulsa next May, has been postponed until the spring of 1948, members of the executive committee decided last week.

Announcement of the postponement of the exposition, the largest industrial show in America devoted to a single industry, was made by Frank J. Hinderliter of the Hinderliter Tool Co., who presided over the meeting.

The committee postponed the show when it was shown that lack of construction materials, building restrictions, and housing problems would considerably hamper the exposition.

"Demands for space from representative companies far exceeded our original expectations, giving rise to the belief that with present conditions prevailing, we would not be prepared to take care of the exposition at such an early date," Hinderliter said.

That the next exposition will be even larger than past shows was indicated when Hinderliter said it would require additional time to secure the necessary land surrounding the present exposition plant to accommodate the large number of exhibitors who had already applied for space.

Members of the committee who approved the postponement action included Hinderliter, W. G. Skelly, Skelly Oil Co., president of the International Petroleum Exposition; F. O. Prior, Stanolind Oil Co.; Clyde H. Pape, independent oil operator; and W. M. Bovaird, Bovaird Supply Co.

"We regretted very much having to postpone the show, but the shortage of construction materials, coupled with governmental building restrictions, makes it impractical for us to continue with plans for the exposition before the spring of 1948," Hinderliter added.

"In addition, the problem of housing the huge number of exhibitors and members of the industry who would attend the show was proving insurmountable. We felt it would be unfair to the traveling public, at this time, to attempt to tie up necessary hotel accommodations in Tulsa and surrounding towns for the exposition."

W. B. Way, general manager of the exposition, was instructed to notify all exhibitors of past shows and new applicants for space of the postponement until the spring of 1948. The last exposition was held in Tulsa in 1940.

Wilson Scores OPA'S Restraint on Oil Industry

WHITING, Ind.—Dr. Robert E. Wilson, chairman of the board of Standard Oil Co. (Ind.) last week told company stockholders at the annual meeting that "our civilization has become far too complex to permit a few individuals to endanger its entire functioning" by cutting off essential supplies and services.

Referring to the recent wave of nation-wide strikes, Dr. Wilson said such activities "jeopardize the ability of all of us to earn a living or enjoy the fruits of what our nation could produce."

On the subject of petroleum product shortages, and particularly lead which is important to quality gasoline, he said, "In this industry we have plenty of crude oil and more refining capacity than is needed to meet current demand. There is an abundance of competition to assure automatic control of price situations. Yet the OPA continues its puny attempts to run by hand, a machine that will run much better under its own free power."

In another address last week before the fuel oil forum of the international convention of the National Association of Purchasing Agents, Dr. Wilson further criticized the OPA for its restraint on the oil industry. He pointed out that the increased costs of finding and developing crude oil production practically necessitates an increase in crude and product prices over the next few years.

He emphasized the fact that while there had been some shortages of certain fuel oils last winter, they were caused entirely by the OPA's failure to act on earlier oil industry warnings as to the inevitable effects of a frozen price structure based on a period when it was desired to maximize gasoline production. "The industry," he said, "could not afford to produce the required quantities of fuel oil on the prices which prevailed at the time."

Other States Follow Texas In Boosting Allowables

June allowables were being hiked by the several state regulatory bodies last week. Texas earlier took the lead when the Railroad Commission set a June allowable to produce 2,293,092 bbl. daily, an all-time high for the state. Oklahoma, Kansas and Louisiana each set June allowables 10,000 bbl. over May figures.

Oklahoma's Corporation Commission set June allowable at 380,000 bbl. daily, as recommended by the Bureau of Mines, after a hearing in Oklahoma City. New pools added to the list of prorated fields are Alma, South Ardmore, Garber-Wilcox, and Wewoka Lake. Total allocated production was estimated at 191,595 bbl. a day. Revisions in allocated quotas included an increase of 5,000 bbl. daily in the West Edmond field, to 75,000 bbl. daily; the Apache pool from 2,550 bbl. to 3,900 bbl. daily; and the Oklahoma City-Wilcox, increased 500 bbl. to 21,500 bbl. daily.

Kansas' allowable was stepped up 10,000 bbl. daily to 260,000 bbl. for June, upon recommendation by the conservation director, to keep pace with increasing demand.

June allocation for New Mexico was set at 106,000 bbl. daily, as announced by the Oil Conservation Commission at Hobbs. New Mexico's production for the week ended June 1 was 95,300 bbl.

The Louisiana Department of Conservation raised June allowables 10,639 bbl. daily to 417,864 bbl., in keeping with increased demand. At the same time, the department announced the next hearing would be held June 13 at New Orleans on market demand to set gas well and field allowables for the 62-day period of July and August.

Sunray-Transwestern Agreement Ratified

At a meeting in Tulsa last week, directors of Sunray Oil Corp. ratified the agreement whereby Sunray will take over Transwestern Oil Co. Directors of Transwestern had ratified the agreement at a meeting in New York.

Sunray directors also voted to increase the number of directors from 9 to 11 to admit Arthur Seeligson, president of Transwestern, and Charles Urschel, trustee of the Tom Slick estate, to the Sunray board. The deal will be consummated upon ratification by stockholders of the two companies at a meeting in July.

Canada's March Output Gains 8.7 Per Cent

WASHINGTON.—Production of crude oil and natural gasoline in Canada for the first quarter 1946, was 1,954,156 bbl., (35 gal. per bbl.) against 2,440,183 bbl. in the first 3 months of 1945, a decrease of 19.9 per cent. However, March production of 663,537 bbl. was up 8.7 per cent over February's 610,292 bbl.

Alberta's March production was reported at 644,205 bbl., including 580,988 bbl. from the Turner Valley field. Other areas and their reported production for March are: New Brunswick, 2,220 bbl.; Ontario, 8,939 bbl.; Saskatchewan, 4,603 bbl., and the Northwest Territories, 3,570 bbl.

Production of natural gas in Canada during March 1946, amounted to 4,627,323,000 cu. ft., compared with 5,231,455,000 cu. ft. in February. Total production for the first quarter, 1946, was 15,498,866,000 cu. ft., of which Alberta accounted for 12,588,101,000 cu. ft.

Alberta Company Plans Gas Synthesis Plant

A Calgary, Alta., oil company is reported to be erecting a $100,000 pilot plant for making gasoline from natural gas, using a process said to be entirely original with the developing company.

The plant will be capable of handling 2,000,000 cu. ft. of gas a day, recovering about 5 gal. of gasoline per 1,000 cu. ft. It is expected to be in operation by fall, according to a report to the U. S. Bureau of Foreign and Domestic Commerce.

Richmond, Calif., Wharfing Facilities to Be Modernized

SAN FRANCISCO.—Plans to modernize its Richmond, Calif., refinery wharfing facilities were announced this week by Standard Oil Co. of California following approval of the $4,370,000 project by the Civilian Production Administration.

Provided for in the plans are a truck causeway, enlargement of the pier to increase docking space from the present three deep-water berths to five and to provide space for six barges, and reconstruction of the repair dock, office building, machine shop and warehouse. The loading section will be lengthened from its present 1,516 ft. to 2,466 ft. A mile-long, two-lane causeway of reinforced concrete with asphaltic surface will connect the wharf to the shore.

Seismograph Crew Member Gets Safety Council Medal

BARTLESVILLE, Okla.—The President's Medal, highest ranking award of the National Safety Council, has been presented to W. O. Briscoe, Jr., Shawnee, Okla., member of a Cities Service Oil Co. seismograph crew.

The medal was in recognition of Briscoe's successful efforts in saving the life of Ralph E. Brown, Seminole, Okla., a fellow worker, who was knocked down by lightning near his dynamite-laden truck. Briscoe applied artificial respiration.

Presentation of the medal was made at an Oklahoma City meeting of approximately 250 Cities Service employes. The seismograph crew to which Briscoe and Brown are attached is now headquartered at Anadarko, Okla.

International

WORLD-WIDE OIL DEVELOPMENTS

China Due for Extensive Wildcatting Campaign

NEW YORK. — An extensive wildcatting program in certain areas in China—the island of Formosa in particular—is slated for the near future, Dr. C. D. Shiah, head of the technical department, National Resources Commission of China, told The Oil and Gas Journal here last week.

Dr. Shiah based his observations largely on the favorable report submitted recently by Glenn M. Ruby, vice president of United Engineering Corp., S. A., and Arthur D. Small, chief petroleum engineer, both of whom visited China prior to making the report.

To date China's only commercial production has been from the Yumen field in the Kansu province under the guidance of the Kansu Petroleum Production and Refining Administration. Production during the past year was approximately 1,400 bbl. daily. Since the end of the war some wells here have been shut in. Some time soon, a 1,500-bbl. daily Dubbs cracking unit will be installed in this area.

The greatest problem concerning products shipment from Kansu to outside areas is the lack of adequate transportation, Ruby pointed out. To move products from the Kansu area, it takes about 80 per cent of the available gasoline to get out the remaining 20 per cent. Currently, the output from the Kansu topping plant is consumed locally. Cost of the projected 2,000-mile pipe line to Central China has been estimated at $30,000,000 to $50,000,000.

Regarding postwar oil activities on Formosa, Dr. Shiah said that some refinery equipment has been purchased and that eventually a refinery, of some several thousand barrels daily capacity, will be rebuilt at Takao on the southwestern tip of the island. Production so far has been limited to the western island areas where there are now two fields, Kinsui and Shikkoko. Excellently located geographically, Dr. Shiah said that future exploration and production activities here would be given an "A-1 priority." Production in Kinsui is largely gas.

Meanwhile, other authoritative sources here report the Chinese Government has purchased some surplus refinery equipment on the West Coast of the United States, and it is believed these refineries will be operated by the Chinese Government. Four surplus ocean-going and an undisclosed number of coastal tankers also were recently acquired.

Regarding government operations of refineries and production, Shiah said that while these operations are currently being carried on by the Government, there is not, and he didn't expect there would be, any objection to private foreign capital entering these fields. Possibly, government partnership with private oil companies will be one method of operation, but apparently this will not deter other types of refining and production developments.

Russia Pushes Search For Azerbaijan Oil

MOSCOW.—With special attention being paid to Russia's new 5-year plan, part of which visions expanded drilling activity offshore in the Caspian Sea, an official radio announcement here last week stated that a 17,000,000-ton (119,000,000 bbl.) output is expected from Soviet Azerbaijan by 1950.

Sixty Russian engineers reportedly have surveyed 400 square miles of Soviet Azerbaijan in search of new oil deposits. Russia has also been surveying oil possibilities in the Emba River region. The Emba River flows from the southern Urals into the Caspian Sea.

While the only official Russian production figure made here in years was Stalin's recent announcement that 31,000,000 tons (217,000,000 bbl.) was produced throughout the Soviet Union in 1940, well-informed sources state that whatever the actual facts it is certain Russia will step up oil activities over the next few years.

As part of Russia's overall plans to strengthen herself industrially, it is generally known that she wants to be in a tactical position of being an oil source for surrounding countries. For instance, there is one report of Finnish negotiations with Russia regarding the delivery of considerable quantities of gasoline and lubricating oil to Finland.

It is thought, in some sources, that Finland is probably being forced into a trade position, for in 1945 she received only 25 per cent of the oil imports which she previously received under German domination, an indication that Russia is taking all she can from Soviet-dominated areas which once supplied the Scandinavian country with her normal requirements. In 1938 these were 248,000 tons (1,736,000 bbl.). This figure compares with 1945 imports of 25,000 tons (175,000 bbl.). At present, Finland can obtain her petroleum imports only from Russian sources.

Meanwhile Russian-dominated Hungary is scheduled to provide Czechoslovakia with $14,000,000 worth of petroleum products over the next 6 years, according to provisions of an agreement recently signed between these countries. Whether this goes off as planned will depend, to a great extent, upon the success of joint Allied protests charging Russia with misinterpreting certain clauses of the Potsdam agreement as to exactly what constitutes "German assets"—a much misunderstood clause. At present Russia is laying claim to extensive oil properties in the Balkans which were "legally" German only insofar as the change of ownership came about under duress.

Portugal's Oil Imports Show Heavy Increase

LISBON.—Portugal's 1945 imports of crude oil and petroleum totaled 182,634 metric tons (1,278,438 bbl.) compared with 109,625 metric tons (767,375 bbl.) for 1944, according to figures just released here. No crude was imported in 1943 or 1944 and only 26,820 metric tons (187,740 bbl.) in 1945.

Sociedade Anonima Concessionaria da Refinacao de Petroleos em Portugal, commonly known as "SACOR," holds exclusive government license to refine oil in Portugal. The company is owned two-thirds by private capital and one-third by the Government. To date there has been no production in this country. However, some drill-

Year	Crude oil	Gasoline	Kerosene	Lubricating oils	Gas, oil, fuel oils	Other oils	Total
1940	115,900	34,322	22,573	6,914	36,299	1,002	217,010
1941	103,891	34,565	14,274	1,913	25,490	460	180,593
1942	17,471	13,189	2,176	1,682	8,086	172	42,776
1943	.....	31,027	17,432	5,965	31,965	183	86,572
1944	.....	38,898	26,569	6,854	37,218	86	109,625
1945	26,820	44,089	33,550	6,322	71,156	697	182,634

ing has been done by Anglo-Portuguese Oil Co., Ltd.

Gas and fuel oil imports jumped from 37,218 metric tons (260,526 bbl.) in 1944 to 71,156 metric tons (498,092 bbl.) in 1945. This marked recovery was badly needed in view of Portugal's shortage of alternative fuels. Gasoline supplies, in 1945, also showed an increase. The country's lack of tanker capacity has been evident for the past 4 years.

All restrictions on the sale of gasoline, as well as fuel and diesel oil were lifted April 1.

Accompanying table shows Portuguese imports from 1940-1945, in metric tons.*

*A metric ton is equivalent to 7.425 bbl.

Commission to Arbitrate Iranian Workers' Demands

TEHERAN. — A leftist-supported strike by workers of Anglo-Iranian Oil Co. is reported to have ended recently after halting production in oil fields and refineries for 2 weeks. The strikers returned to work after agreeing to submit their demands, which included doubling of their present wages and a month's annual vacation with pay, to an Iranian Government arbitration commission.

Anglo-Iranian officials pointed out the company had recently raised laborers' wages from 60 cents to $1.10 a day and that it had already made concessions greater than Iran's new labor law requires.

The strike was said to be supported by the pro-Russian Tudeh party and was led by Hadji Hashemjefi, often associated with Communist activities.

Extensive Expenditures Necessary in Burma

LONDON.—Rehabilitation of Burma's oil industry will be an important step in the restoration of economic activities there, according to P. Evans, chief geologist of the Burmah Oil Co., Ltd. Burmah Oil holds substantial stock interest in Anglo-Iranian Oil Co., Ltd.

Extensive financial expenditures, along engineering lines in particular, will be necessary to bring Burma's oil activities back to prewar levels, Evans explained, for when the Japanese overran this country in 1942, refineries and oil field installations were demolished. Essential buildings were dynamited, and oil tanks set on fire. In the fields the more important wells were plugged. Surface machinery was destroyed, and the power station blown up.

Despite the destruction, however, the Japs regained some of the production, although their reconstruction work was interrupted from time to time by Allied bombing. The fields were in Jap possession for 3 years but only a small proportion of the 21,000 bbl. daily prewar output was restored.

Currently, a British military unit has maintained production from the few wells that the Japs managed to rehabilitate, but the output is only about one-tenth former production.

Meanwhile, Evans disclosed that Assam Oil Co., Ltd., a subsidiary of Burmah Oil in India, had increased prewar production of 4,500 bbl. daily to approximately 6,000 bbl. daily. Assam's oil field at Digboi is located on what was the supply line to Burma and China, and output here made a distinct contribution in the military drive into Burma.

Agreement Ends Strike Threat in Venezuela

CARACAS.—Fear of a nation-wide strike which would halt oil production here is now over following the report of an agreement reached here between oil companies and the Oil Workers' Federation.

Provisions for a 19-month collective contract, effective June 1, which will grant workers a wage hike of 2 bolivares ($0.60) a day are in the contract. An increase of 4 bolivares a day was asked. While the contract provides for numerous other undisclosed concessions, the demands considered by the companies as infringing upon management were not granted.

The agreement — made after 2 months of negotiations—was signed in the presence of Dr. Raoul Leoni, minister of labor and a member of the junta governing Venezuela. He acted as mediator during the final conferences.

Equipment Needs Delays Production in Qatar

NEW YORK.—Because of the difficulty of obtaining necessary drilling and construction equipment, no production is expected from Qatar's Dukhan field for at least 2 years, according to a reliable authority here. Qatar is an independent sheikdom in the Persian Gulf.

Before the war three wells were drilled here, with two of them substantial producers. All were plugged when it was feared that the Germans would overrun the area. Three rigs will be put to work reconditioning the wells as soon as possible. Except for the camp itself, all equipment, including even air-conditioning units, was moved to India and elsewhere.

Loading racks and three 93,000-bbl. storage tanks are expected to be built here within the next 2 years. The eventual shipping point of the crude reportedly has not been determined.

The operating company is Petroleum Development (Qatar) Ltd., an affiliate of Iraq Petroleum Co., Ltd., whose four main owners are: Anglo-Iranian Oil Co., Ltd.; Anglo-Saxon Petroleum Co., Ltd. (Shell Group); Compagnie Francaise des Petroles; and Near East Development Corp. (Standard Oil Co., N. J.) and Socony-Vacuum Oil Co., Inc.)

Northern Mexico Output Continues to Increase

MEXICO CITY. — Production in Mexico's three northern fields, Poza Rica, Naranjos, and Panuco, continued its upward trend, with a gain of nearly 14 per cent in March daily average output over the daily average at the first of the year. Stocks at terminals and in fields of the northern zone declined 11.9 per cent for the same period.

The daily average production reported in the three fields reached 111,452 bbl. in March, compared with 108,228 bbl. in February and 97,991 bbl. in January. Total production for the first quarter, 1946, was 9,522,928 bbl. Stocks at fields and terminals totaled 3,524,266 bbl. at the end of March, against 3,998,415 bbl. on February 28. Distribution of the stocks were: Poza Rica, 1,602,986 bbl.; Naranjos, 777,612 bbl., and Panuco, 1,143,668 bbl.

Mexico was looking to a great demand for its asphalt in the reconstruction of Europe. A shipment of 8,612 metric tons of asphalt was reported to have left Tampico for Antwerp on April 3.

Pipe-Line Agreement Made

JERUSALEM.—Four weeks' negotiations between representatives of Arabian-American Oil Co. and the Trans-Jordan Government for building an oil pipe line across Trans-Jordan have been completed, according to reports here. An agreement for laying the line across the country was reached.

International Petroleum Outlook in Relation To Operations in the United States

by C. O. Willson

IT is the purpose of this paper to summarize briefly the production, consumption, and transportation position of the world oil business, pointing out those conditions that appear basic in determining future trends in both domestic and foreign operations. This discussion is not concerned with the economic objectives of pending treaties or possible political developments which later may bring about changes in the flow of world petroleum supplies and demands in a manner not determinable at this time.

With the European war ended more than a year ago and the first anniversary of the Japanese victory only a few weeks away, the world today is producing and consuming approximately the same quantities of petroleum that it did at the peak of the war period. The anticipated sharp reductions in military petroleum requirements, except for aviation gasolines, have not materialized up to this time, and it is now conceded that total military needs will be substantially greater than they were prewar for an indefinite period. Navy consumption of petroleum is outstanding in this regard.

Petroleum demands have been large in the rehabilitation of occupied and enemy countries. In the devastated area all rebuilding and reclamation work has largely centered in the use of petroleum for power, fuel, and light. Fuel consumption of marine shipping is much greater than it was prewar. War prosperity over a large part of the Western Hemisphere and outside the fighting areas in the Eastern Hemisphere brought large increases in all phases of petroleum consumption. Most of these demands have been maintained with the return of peace, and with the partial or complete lifting of rationing, many of these outlets have further expanded. This is particularly true of the United States and Canada. Thus the net result, so far, is that increased civilian demands have offset the military losses and the petroleum world today finds itself producing and consuming approximately 2,100,000 bbl. daily more crude oil—a 40 per cent gain—than during the period immediately preceding the war.

This paper was presented June 7 at the meeting of the Division of Production, Mid-Continent district, American Petroleum Institute, at Oklahoma City. Willson is editor of The Oil and Gas Journal.

Production

Table 1 shows the changes that have taken place in world crude-oil production, excluding the U.S.S.R., based on official reports for 1938 and estimated output during late April this year.

TABLE 1—WORLD CRUDE-OIL OUTPUT AND PROVEN RESERVES (EXCLUDING U.S.S.R.)

	1938 (bbl. daily)	‡1946 (bbl. daily)	Increase (bbl. daily)	Proven reserves (thous. bbl.)
North America:				
United States	3,327,000	4,675,000	1,348,000	21,078,024
Other countries	172,500	188,000	15,500	750,000
Total	3,499,500	4,863,000	1,363,500	21,828,024
South America:				
Venezuela	515,000	1,050,000	535,000	6,500,000
Other countries	156,500	173,000	16,500	1,100,000
Total	671,500	1,223,000	551,500	7,600,000
Europe (excluding U.S.S.R.):				
Rumania	132,500	100,000	*32,500	400,000
Other countries	27,000	20,000	*7,000	200 000
Total	159,500	120,000	*39,500	600,000
Asia:				
Middle East†	332,600	705,000	372,400	20,750 000
Far East	220,800	105,000	*115,800	1,070,000
Total	553,400	810,000	256,600	21,820,000
Grand total	4,883,900	7,016,000	2,132,100	51,848,024

*Decrease. †Middle East includes Egypt. ‡Estimated output in late April.

The outstanding condition revealed in this table is that practically all the increase in world petroleum production since 1938 has been in the United States, Venezuela, and the Middle East (Iran, Saudi Arabia, Bahrein Island, Iraq, and Egypt). Gain in production of these three areas since 1938—2,225,400 bbl. daily—is greater than the total world gain of 2,132,100 bbl. It is also worthy of note that the three areas accounted for 85.5 per cent of the world crude-oil output (exclusive of U.S.S.R.) in 1938 and 91.6 per cent at this time.

The dominance of the three areas is more apparent when the reserve data are considered. They account for all but 3,520,000,000 bbl. of the world total (exclusive of the U.S.S.R.) or 93.2 per cent. Thus, in effect, when oil supplies available for world markets are analyzed the discussion can be largely limited to the Gulf Coast and California in the United States; Venezuela and the adjoining West Indies refineries; and the Persian Gulf and Eastern Mediterranean which constitute the shipping points of what is commonly termed the Middle East region. It is improbable that this comparative situation will change materially over the next decade. The Far East, China, new sections of South America, and other parts of the world are to be explored for additional reserves but past experience indicates that several years would elapse, under the most favorable conditions, before any new oil-producing center could seriously challenge the strong position of the three areas where oil development has been under way for 25 or more years.

Unfortunately, there are not sufficient data available to include the U.S.S.R. in a world petroleum report at this time. Before the war, Russia was both a small importer and a small exporter of petroleum. Substantial shipments were made by the Allies to the U.S.S.R. during the war period. Her own production during the latter part of the war was estimated at approximately 700,000 bbl. daily. Since the war she has reported large oil reserves discovered over the

past 10 years and new refinery construction is planned or under way. The carrying out of these programs is largely dependent on the purchase of American oil equipment and supplies. Those most familiar with conditions do not expect the U.S.S.R. to be an important factor in world oil markets in the near future, with any immediate increases in output to be absorbed within her boundaries.

Ownership

The control of the three large sources of world oil supply is obviously important in attempting to project future oil trends. It is not necessary to explain ownership in the United States except to point out that several of the large operating companies in this country are also the major operators in Venezuela and the Middle East. Of the 705,000 bbl. daily current production in the Middle East, 470,000 is owned by British or British-Dutch interests, 212,000 bbl. daily by American companies, and 22,500 bbl. by a company controlled by the French Government. These figures do not take into consideration the royalty interests. In Venezuela a recent report showed that approximately 70 per cent of the production was American owned, and the remainder was controlled by British-Dutch interests. Thus the operating responsibility of the Middle East and Venezuelan oil developments largely centers in six American and two British and British-Dutch companies. With the exception of the British company—Anglo-Iranian Oil Co., Ltd.—all of these companies either directly or through affiliated or subsidiary interests, are also major operators in the United States.

Demand

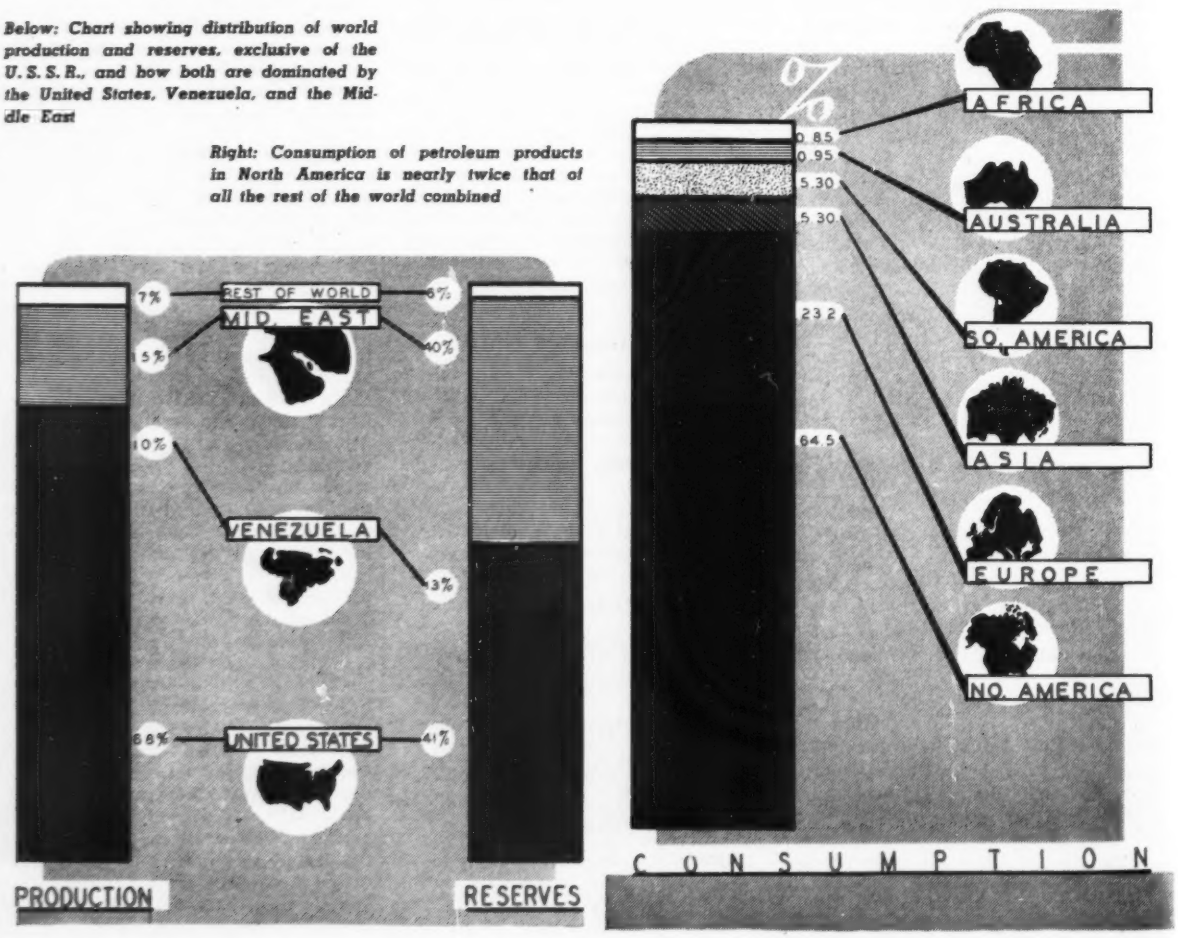
A breakdown of present petroleum consumption on a basis comparable with prewar practice is not possible at this time. Competent analysts are in agreement that one or more years will elapse before the transition from war to peace is completed and the world oil industry will again have data accurately reflecting demands by countries. This situation applies particularly to a large part of the Eastern Hemisphere.

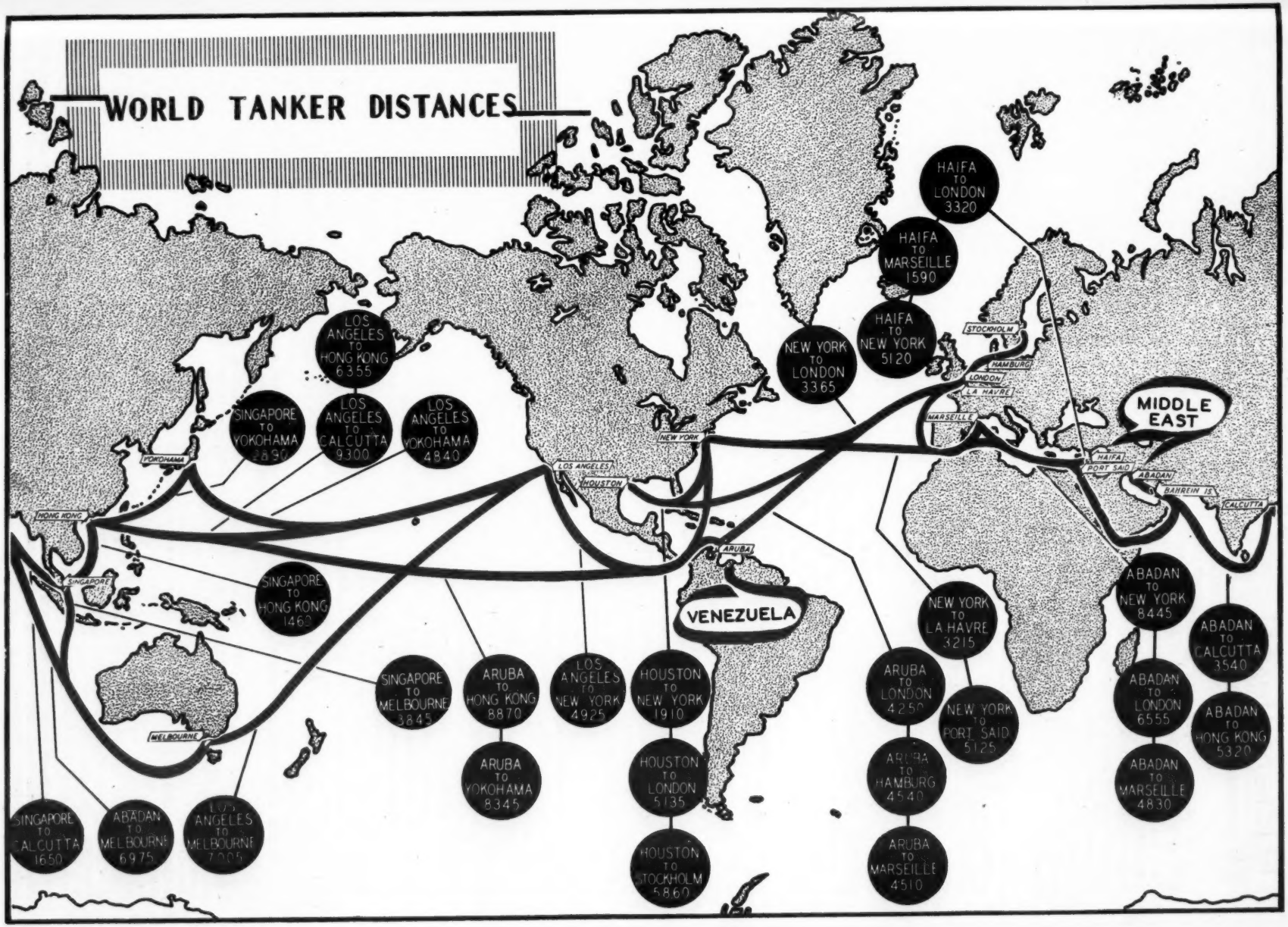
The available reports do reveal that the United States during the war period and since accounted for the bulk of the increased world consumption, the gain coming both from expansion in domestic consumption and enlarged exports. Bureau of Mines reports show that the total petroleum demands (domestic plus exports) in the United States increased from 1,330,850,000 bbl. in 1938 to 1,952,140,000 bbl. in 1945, an increase of 621,290,000 bbl. or 1,700,000 bbl. daily. Allied military requirements explain a part of the 1945 petroleum demands in this country but military losses in 1946 have been largely offset with increased civilian consumption so that total requirements for domestic crude oil in this country are now within 5 per cent of the war peak.

Some economists in projecting postwar demands by areas or countries are using 1939 consumption data as the base for estimates covering the future divisions of markets. It is realized that changes in economic conditions brought about by the war will mean that postwar trends will not duplicate prewar conditions in several consuming areas. Reports on recent shipments indicate that present petroleum consumption of some coun-

Below: Chart showing distribution of world production and reserves, exclusive of the U. S. S. R., and how both are dominated by the United States, Venezuela, and the Middle East

Right: Consumption of petroleum products in North America is nearly twice that of all the rest of the world combined




WORLD TANKER DISTANCES
HAIFA TO LONDON 3320
HAIFA TO MARSEILLE 1590
HAIFA TO NEW YORK 5120
NEW YORK TO LONDON 3365
LOS ANGELES TO HONG KONG 6355
SINGAPORE TO YOKOHAMA 2890
LOS ANGELES TO CALCUTTA 9300
LOS ANGELES TO YOKOHAMA 4840
SINGAPORE TO HONG KONG 1462
SINGAPORE TO MELBOURNE 3845
ARUBA TO HONG KONG 8870
LOS ANGELES TO NEW YORK 4925
HOUSTON TO NEW YORK 1910
ARUBA TO YOKOHAMA 8345
HOUSTON TO LONDON 5135
HOUSTON TO STOCKHOLM 5860
SINGAPORE TO CALCUTTA 1650
ABADAN TO MELBOURNE 6975
LOS ANGELES TO MELBOURNE 7005
NEW YORK TO LA HAVRE 3215
ARUBA TO LONDON 4250
NEW YORK TO PORT SAID 5125
ARUBA TO HAMBURG 4540
ARUBA TO MARSEILLE 4510
ABADAN TO NEW YORK 8445
ABADAN TO CALCUTTA 3540
ABADAN TO LONDON 6555
ABADAN TO HONG KONG 5320
ABADAN TO MARSEILLE 4830
VENEZUELA
MIDDLE EAST
STOCKHOLM
HAMBURG
LONDON
LA HAVRE
MARSEILLE
NEW YORK
LOS ANGELES
HOUSTON
YOKOHAMA
HONG KONG
SINGAPORE
MELBOURNE
ARUBA
HAIFA
PORT SAID
ABADAN
BAHREIN IS.
CALCUTTA

tries is 50 to 100 per cent greater than it was before the start of World War 2. But it seems reasonable to conclude that some time will elapse before the settled petroleum needs of war-devastated areas of Europe will approach prewar levels.

Table 2 summarizes by continents the total consumption of petroleum for 1939:

TABLE 2

Continent—	Consumption* (1,000 bbl.)	Per cent
North America	1,305,450	64.5
South America	106,977	5.3
Europe	469,645	23.2
Asia	105,500	5.2
Africa	17,316	.85
Australia	19,050	.95
Total	2,023,938	100.00

*Derived from 1939 world consumption report of V. R. Garfias, R. V. Whitsel, and J. W. Riston, Cities Service Co., presented at annual A.I.M.E. meeting, New York, 1940, and published by Petroleum Development and Technology.

This table includes the U.S.S.R. with an estimated demand in 1939 of 170,000,000 bbl. or 8.4 per cent of the world total.

For the purposes of this discussion it is sufficient to point out the concentration of petroleum consumption. In 1939 the petroleum consumption of this country aggregated 1,233,000,000 bbl. or 60.9 per cent of the world total. The United States should be considered with Canada which had a consumption of 50,800,000 bbl. in 1939 or 2.5 per cent of the world total.

The other large petroleum market previous to the war was Western Europe. Ten countries — the United Kingdom, Germany, France, Sweden, Denmark, Belgium, Norway, Spain, Switzerland, and Finland—in the order named were the principal consumers of petroleum in Western Europe with a total demand in 1939 of 235,500,000 bbl. or 11.1 per cent of the world total. Thus in 1939, United States-Canada, Western Europe, and the U.S.S.R. accounted for nearly 83 per cent of the world petroleum demands.

In this discussion the consumer status of United States-Canada and Western Europe is of controlling importance. United States-Canada has expanded its position in world oil consumption and its percentage of the total now exceeds the 63.4 per cent of 1939. Most of Western Europe is in the midst of a rehabilitation period and its postwar position as a consumer of petroleum products cannot be determined at this time. It is certain, however, that Western Europe is the only large market to which operators in the United States, Venezuela, and the Middle East can look for outlets in excess of consumer demands within their local areas for a long period. Previous to the war, Venezuela and the adjoining refineries in the Netherlands West Indies disposed of a large part of their output in Western Europe. For example, shipments from the West Indies refineries supplied approximately 50 per cent of the 250,000-bbl. daily market of the United Kingdom, the largest of Western Europe. The same refineries made shipments to practically all of the other countries of that area. Rumania, which, prewar, had a surplus of approximately 80,000 bbl. daily in excess of its domestic requirements, also looked to Western Europe for outlets. The terminals of Tripoli, Lebanon, and Haifa, Palestine, the Eastern Mediterranean shipping points for Iraq crude oil, disposed of most of their 90,000-bbl. daily production in France and parts of Western Europe. Countries of the same area ranked next to Canada as outlets for the United States. It is due to this situation that the rehabilitation of Western Europe, involving equipment and supplies and loans from the United States, is of primary importance in the postwar outlook of the petroleum industry.

Transportation

Keeping in mind that the United States, Venezuela, and the Middle East have the controlling position in crude-oil supplies and the United States-Canada and Western Europe are the major consuming areas, we can now consider the third factor in future world oil trends—transportation. Table 3 gives a quick summary of distances between the principal sources of world oil supplies and the large consuming centers. Representative tanker lanes are shown on the accompanying map.

It will be pointed out by students of this industry that the international movement of oil is not determined solely by tanker distances. That is true. Cost of field production, rates of exchange, spheres of influence, ownership of marketing and transportation facilities, import duties, and policies of individual governments and operating companies have a bearing on the movement of oil from the fields to the consuming points. No attempt is made to evaluate these factors in this discussion. A study of the past conditions will reveal, however, that despite those limiting factors tanker distances have determined the over-all international movement of petroleum just as distances and transportation costs have controlled the pattern of domestic operations in the United States.

A summary analysis of the tanker situation in world oil markets can be quickly made. Very little of the petroleum supplies of the Persian Gulf, despite the fact that previous to the war they were largely owned by a company in which the British Government has a controlling stock interest, was disposed of in Western European markets. The distances from the Gulf Coast of the United States and from Venezuelan-West Indies refineries to Western Europe are 25 to 50 per cent shorter than the water movement from Abadan, Bahrein Island, and Arabia in the Persian Gulf area. The Suez canal toll now amounting to about 18 cents per barrel in Persian Gulf-Western Europe shipment has also been important in the decision to supply most of the European markets from the Western Hemisphere.

Regarding the future it is important to note that the tanker distance from Haifa to London is approximately 50 per cent less than it is from Abadan with no Suez canal toll. This reflects

TABLE 3—TANKER DISTANCES IN NAUTICAL MILES BETWEEN REPRESENTATIVE PETROLEUM SHIPPING AND CONSUMING CENTERS

Consuming centers—	Shipping points — Houston	Los Angeles	Aruba	Maracaibo	New York	Abadan	Bahrein Island	Haifa	Singapore
London	5,135	*7,705	†4,250	†4,420	3,365	‡6,555	‡6,355	3,320	‡8,245
Le Havre	4,985	*7,555	†4,100	†4,270	3,215	‡6,390	‡6,190	3,155	‡8,095
Stockholm	§5,860	*¶8,520	§5,065	§5,345	¶4,180	‡¶7,370	‡¶7,170	¶4,135	‡¶9,060
Hamburg	5,425	¶7,995	†4,540	4,710	3,655	‡6,845	‡6,645	3,610	‡8,535
Lisbon	4,690	*7,105	†3,645	3,815	2,970	‡5,535	‡5,335	2,300	‡7,225
Marseille	5,480	*7,975	†4,510	4,680	3,900	‡4,830	‡4,630	1,590	‡6,520
Naples	5,770	*8,265	†4,800	†4,970	4,190	‡4,430	‡4,230	1,185	‡6,120
Port Said	6,705	*9,200	†5,735	5,905	5,125	‡3,320	‡3,120	170	‡5,010
Calcutta	‡11,385	9,300	‡10,425	‡10,595	‡9,815	3,540	3,335	‡4,860	1,650
Hong Kong	*10,775	6,355	*9,870	*9,840	*11,210	5,320	5,120	‡6,640	1,460
Yokohama	*9,260	4,840	*8,355	*8,345	*9,700	6,750	6,550	‡8,070	2,890
New York	1,910	*4,925	1,760	1,890	.....	‡8,445	‡8,245	5,210	*12,505
Melbourne	*9,495	7,005	*8,595	*8,565	*9,930	6,975	6,775	‡8,005	3,845

*Via Panama Canal. †Via Mona Pass. ‡Via Suez Canal. §Via Cape Wrath. ¶Via Kiel Canal. Note: Shortest distances are shown in all cases. In some cases, longer distances would enable shipper to avoid canal tolls. Singapore is used as a representative shipping point for East Indies petroleum.

the great advantage which would result in a pipe-line system, such as now is proposed, connecting the Persian Gulf with the Eastern Mediterranean. In addition to the tanker distance the Suez toll would be saved. Assuming a pipe-line operating cost comparable to the operation of the big-inch lines in the United States it is apparent that the construction of one or more big-inch Persian Gulf-Eastern Mediterranean lines would largely offset the transportation advantages which the Western Hemisphere has to the Western European markets. It should also be pointed out that the substantial increase in Persian Gulf production over the past 6 years and the future increases in prospect and the work now under way to triple the delivery of Iraq crude oil at Haifa and Tripoli terminals to nearly 300,000 bbl. daily, in effect means the Middle East operators in the future will have to look to Europe as an outlet for a larger percentage of their petroleum supplies.

Military Provides Market

At present there is ready market for most of the increased output of Persian Gulf refineries to the military operating in that general area and to the markets of the Eastern Pacific, in addition to local markets. Plans for rehabilitating the petroleum properties of the Far East and India have been slow in getting under way owing to political conditions and this fact has furnished a substantial market to the Persian Gulf refineries. It has been estimated that the Far East operations will not be back to a prewar basis for at least another 18 months.

When these operations return to normal the supplies will still be less than the demands of the Pacific area of the Eastern Hemisphere including Australia. In the past this deficit has been largely made up by export shipments from California. In the future, as revealed in Table 3 and the map, California will have the competition of the enlarged supplies from the Persian Gulf with the latter area having an advantage in distances to most markets.

The conclusion generally drawn by economists from studies of probable conditions after the reconversion period is completed, is that the Middle East will absorb more and more of the Eastern Hemisphere markets to the exclusion of the surplus producing areas of the Western Hemisphere. This is not a development that will be completed in a year or two but does appear to be a trend that will be under way as soon as the reconversion period is completed.

The question is often asked whether the increasing supplies of the Middle East will be brought to the United States and other parts of the Western Hemisphere to supply domestic markets. This operation, as shown in the tanker-mileage table, would be possible only if the shipper was willing to absorb the substantial additional transportation charge. The distance from Bahrein Island to New York City is 8,245 miles via the Suez Canal which would include the canal toll charge. Tanker shipments from the Eastern Mediterranean would be much shorter should a pipe line be built from the Persian Gulf but the transportation costs would still be greater to the New York harbor area than they are from the Gulf Coast of the United States or the northern tier of South American countries. Shipments from the Persian Gulf to California have also been discussed. Still greater distances than the New York-Bahrein Island route would be involved, the distance from Abadan to Los Angeles being 11,150 nautical miles. These shipments to the United States are not possible under the rates in effect under the U. S. maritime authority. It is too early to determine what the tanker rates will be with a resumption of an open market and the ending of all government controls.

This situation means in effect that the Western Hemisphere will be more dependent on itself for the disposal of its crude-oil supplies. The exceptions are lubricating oils and certain specialty products. It so happens that most of the crude oil produced outside the United States and the U.S.S.R. is high in sulfur content, commonly termed "sour" crude. Much of it is also low in gravity. It is not suitable for the manufacture of lubricating oils and wax and at this time all but a small part of the world lubricating stocks and finished oils (outside the U.S.S.R.) are manufactured in this country. Modern processing methods are widening the types of crudes that can be used in the manufacture of lubricants but the position of the United States in supplying crude oil for manufacturing lubricants at foreign refineries or manufacturing export requirements at its own refineries is not seriously threatened at this time.

Regarding the disposal of western petroleum supplies within the Western Hemisphere, it is apparent that the answer lies in future policies applying to the United States and Canada which, prewar, had 91 per cent of the petroleum consumption in this hemisphere. The petroleum consumption of South America, Central America, and Mexico is increasing but a large part of their needs is obtained from local sources and the excess output of the smaller producing countries of Colombia, Peru, and Trinidad. Western Hemisphere petroleum consumption, outside the United States and Canada, is not now, and will not be in the foreseeable future, an important outlet for the large supplies of Venezuelan petroleum.

The obvious answer to this question lies in a realistic approach to the

future problem of balancing United States-Venezuelan supplies with United States-Canadian requirements. This ties in with the ability of this country to supply from within its own boundaries a demand which is now approaching 5,000,000 bbl. daily, exclusive of exports. It also involves the matter of whether or not the United States should continue its prewar policy of exporting approximately 10 per cent of its domestic and imported petroleum output. If this practice is discontinued, Venezuela and the smaller exporting countries of South America are the logical heirs to those markets which they can economically serve. A further conclusion, which appears equally obvious to the writer, is that this country and its petroleum operators, with more than 60 per cent of the production and consumption and with its nationals occupying a major position in the petroleum supplies, transportation, and markets throughout the rest of the world (outside of U.S.S.R.), should be able to accept its responsibility of balancing future operations so that petroleum will play a stronger part than ever before in the construction and peaceful development of a world economy.

Potential Markets

No world survey would be complete without pointing to potential outlets for petroleum. We have previously explained the concentration of petroleum consumption in a few countries. The United States, with less than 7 per cent of the world population and land area, has more than 60 per cent of the global petroleum consumption. United States-Canada and Western Europe account for 75 per cent of the world demands with 17 per cent of the population.

The per capita consumption in this country is in the order of 12 bbl. annually. No other country approaches that per capita demand except Canada and its average consumption is less than half that of the United States. In Asia and Africa, where more than 50 per cent of the world's 2,100,000,000 population live, the total petroleum demands are less than that of one of our larger states.

The final suggestion here is that the petroleum industry, which has been so successful in finding new oil reserves, developed them, and refined and transported the products wherever they were needed, give thought to the possibilities of a program looking to the expansion of world-wide uses of petroleum among old and new customers.

WASHINGTON WATCHING

BY HENRY D. RALPH

Authority of OGD

WASHINGTON. — Legislative basis for very broad authority for the new Oil and Gas Division of the Interior Department is contained in new language which the Budget Bureau has asked Congress to insert in the department's pending appropriation bill. It reads:

"For all expenses necessary for coordinating and unifying policies and administration of federal activities relative to oil, gas, and synthetic fuels, including cooperation with the petroleum industry and state authorities in the production, processing, and utilization of petroleum and petroleum products, natural gas, and synthetic fuels, and the compilation of technical reports thereon"; and for administration of the Connally "hot oil" act, travel, printing, stenographic reporting services, and the usual provisions of government appropriations.

Authority Would Be Ample

If Congress adopts this language, OGD will have ample authority to carry out all its present plans for working with other federal and state agencies. However, it will not, in and of itself, take any power away from other agencies. The degree of coordination and unification which results will depend chiefly on the success of Interior Department officials, with White House support if necessary, in inducing the other agencies to submit to coordination and unification of policies.

Moreover, this language in an appropriation bill is not substantive regulatory legislation and will not give OGD nor any other branch of the federal Government any additional controls over the oil and gas industries and functions now performed by state regulatory bodies.

Early this week Acting Director Ralph K. Davies of OGD was still studying names of oil-industry executives who will be invited to serve on the National Petroleum Council. He has expressed satisfaction with the letter from the Attorney-General giving antitrust clearance for the council's formation but was not ready to release its text nor to issue invitations pending further checking of nominations for membership which have been coming in by mail and telegram from many quarters of the industry.

Shortly after the OGD was set up by presidential directive, Davies sought from the Justice Department a clear-cut statement clearing the antitrust aspects of the organization of the council.

A Budget for OGD

A BUDGET of $472,000 to operate the Oil and Gas Division for the fiscal year ending June 30, 1947, has been asked of Congress by the Bureau of the Budget. This includes $247,000 previously approved by the Budget Bureau for the Petroleum Conservation Division which is being absorbed into the OGD.

However, in passing the Interior Department's appropriation bill last month the House whittled off $30,092, giving the Conservation Division only $216,908. The bill is now before the Senate appropriations committee, and whatever amount the Senate adds for OGD will be subject to adjustment when the bill goes to conference with the House.

This recommendation provides only $225,000 for the OGD beyond the amount scheduled for enforcement of the Connally act and other activities of the old Conservation Division. This is a rather small sum, as government agencies go, and indicates that plans for OGD for the next year are not overly ambitious.

No Civil Service Restrictions

The requested appropriation language would permit the employment of a director of the new division without regard to the civil service and classification laws, which means that Secretary Krug may appoint a man from the industry without requiring him to take a civil service examination. Also, he could be fired—or asked to resign—without "cause" and without the tenure protection of civil service employes. The salary provided is "not to exceed $10,000," which is as high as government salaries go except for Cabinet officers and a few other special positions.

The Budget Bureau described OGD as "an organization designed to provide a focal point for leadership and information for federal agencies and others dealing with petroleum."

In asking Congress for the appropriation, the Bureau said: "This estimate contemplates the second step toward bringing the division to operating strength. It has already been called upon to aid in relieving an emergency situation in New England because of the shortage of bituminous coal, and oil was got to that area to keep power and industrial plants operating. Undoubtedly during the reconversion period many problems will be presented to this division for solution. The organization proposed will provide a nucleus upon which to build in the event of emergencies."

Lead Supply Situation

"THE lead situation is becoming progressively worse," says the Civilian Production Administration in commenting on the recent developments to reduce consumption and increase production.

"With the continuation of strikes in the plants of two of the major smelting companies, only 40 per cent of the usual primary pig lead production is available.

"In addition the remaining producers of pig lead will be reducing their output because of seasonal summer reductions brought about by vacation layoffs and losses of labor to farming and government projects.

"Secondary lead production is also falling off materially for the following reasons: (1) price uncertainties, which affect scrap movement to smelters; (2) the coal shortage, which has forced curtailed production and shutdowns; (3) transportation difficulties, and (4) a shortage of prime lead, which is required to make specification metals.

"It will be some time after the termination of the strikes before anything like normal production will be reached again."

Price Increase Approved

Since that report was written the National Wage Stabilization Board has approved an increase of 18½ cents per hour in wages in lead mines and smelters in western states, and the Office of Price Administration has increased the ceiling price of primary lead by 1¼ cents per pound. However, these actions have not yet ended the strikes nor resulted in increased production.

The price of primary lead at New York has now been raised from 6.5 cents to 8.25 cents per pound. The increase was based on an OPA study of increased production costs and on its formula for maintaining 1936-39 profit margins, but it is not as high as the lead industry says is necessary to bring out much additional production. The price of secondary lead was also raised 1¾ cents per pound, but the price of scrap lead was raised

only 1.55 cents per pound, which OPA said should be sufficient to cause more intensive collection of scrap.

Producers of metallic lead products have been permitted by OPA to increase their selling prices by 1¾ cents per pound to cover the higher price of pig lead, but producers of lead pigments and chemicals, including tetraethyl lead, must absorb the increased lead price.

At the same time CPA reduced the octane rating of premium gasoline it also curtailed the use of lead oxide in storage battery production and made a number of other changes in its lead conservation order (M-38).

"Because of strikes," it said, "domestic lead production is currently at a rate less than 50 per cent of the normal 500,000-ton production. Lowered imports and declining receipts of scrap are also aggravating the supply situation. Because of these many adverse factors, CPA indicated that the 880,000 tons supply estimate for 1946 (made at the first of the year) must be revised sharply downward."

Tetraethyl Allocations

SUFFICIENT lead will be allocated for production of tetraethyl lead during June to meet the provisions of the new ethyl fluid order limiting the octane rating of leaded premium gasoline to 78.5 octane at the refinery, the Civilian Production Administration has promised. Allocations of lead for TEL totaled 3,500 tons in April and 4,160 tons in May.

CPA has not made a definite allocation of metallic lead for June since the amount required will depend on the volume of ethyl fluid shipped under the amended order, but it is estimated that approximately 4,200 tons will be used for tetraethyl lead during the month.

The amended ethyl fluid order (L-355) prohibits the producer from delivering to any person in any calendar month more than 24 per cent of the amount delivered to him during the base period—the three months of November and December 1945, and January 1946. However, if a refiner certifies that he used more ethyl fluid than he received during the base period he may receive 27 per cent of the amount he used in production of housebrand gasoline and 22 per cent of the amount he used in premium gasoline during the base period.

No refiner may use a greater quantity of motor ethyl fluid than the aggregate of 27 per cent of the amount used during the base period in the production of housebrand gasoline during any month starting June 1, nor 22 per cent of the amount used in premium. However, a consumption quota may be used in either housebrand or premium gasoline without regard to the percentage of use in the base period so long as gasoline of higher than 78.5 octane is not produced.

Ethyl fluid may not be used in making motor gasoline of more than 78.5 octane (not to reach 79 octane ASTM-D-357-45) at blending point except to fill military contracts on special authorization from CPA.

A new carry-over provision states that if a person uses less ethyl fluid than he is permitted to use in any calendar month, he may add this quantity to his consumption quota, but not to his delivery quota, in the succeeding month.

Price Control Revision

THE Senate banking and currency committee was scheduled to complete its work of revising the price extension law this week and turn it loose on the Senate floor for further mauling. In spite of pleas from President Truman it appeared certain that the Office of Price Control will be far weaker after June 30.

One of the last points to be determined by the committee was the wording of the decontrol amendment. Tentative approval was given to a provision creating an appeals board which could order OPA to remove commodities from price controls on showings made by industry advisory committees, but pending formal report of the bill it was uncertain how this would operate.

At any rate, the chances still are good that the final legislation will contain decontrol provisions which will apply to petroleum. This might make it virtually automatic for OPA to remove oil price ceilings at once, or it might permit OPA to engage in further delaying tactics, but it certainly will permit a new approach to the problem.

Passage to Be Delayed

Since the Senate is expected to take a couple of weeks to debate price control extension, and its version must then be compromised with that passed by the House, the legislation can scarcely reach the White House until very close to the June 30 expiration date of the present law, which means that the oil industry won't know in advance what sort of controls it must operate under on July 1.

Prospects look so bad for passage of the kind of price control law desired by the administration that many of the top executives in OPA are preparing to leave the Government shortly. It is quite probable that Chester Bowles will resign as director of economic stabilization, in which case his functions will likely be absorbed by John W. Snyder, director of War Mobilization and Reconversion, and John D. Small, administrator of the Civilian Production Administration. Both Snyder and Small are "business minded" and opposed to unnecessary government controls over industry. They have frequently expressed a desire to remove OPA price controls which hamper production, and if they get the power to set OPA policies the new act should be administered in a far different way, whatever its exact language.

Compact Studies Proposal For Advisory Committee

OKLAHOMA CITY.—A resolution of the Independent Petroleum Association of America proposing an industry advisory council for the Interstate Oil Compact Commission is now being sent to officials of the 17 compact member states for consideration.

The resolution was presented to the compact commission by Wirt Franklin and Frank Buttram, past presidents of the I.P.A.A., at a meeting of the commissioner's executive committee last week. The executive committee did not pass on the proposal but directed its headquarters to forward it to the governors and their representatives of the commission's member states for their suggestions and comments, according to Earl Foster, commission secretary.

The I.P.A.A. resolution asked the compact to consider the organization and appointment of a national and five district advisory committees to discuss production matters and make recommendations in a manner similar to the Petroleum Industry War Council production committee and the Petroleum Administration for War district production committees. It said the committees should be composed of men in the production industry and that independents should predominate. A somewhat similar resolution was passed by the I.P.A.A. at its Tulsa meeting last October and presented to the commission at its quarterly meeting in Wichita last December.

Some observers of compact activities believe the proposed national advisory committee would overlap to some extent functions of some of the existing advisory committees, and that its appointment might call for reorganization of the present groups. The commission's policy has been to encourage appointment of advisory committees from industry associations.

Castings Ceilings Lifted

WASHINGTON.—Price ceilings on high-alloy steel castings used as component parts of industry equipment have been suspended by the Office of Price Administration. Castings covered by the order are of a type used in heat-treating, chemical plant, and oil refinery equipment.

Lubrication Problems Dominate S.A.E. Meeting Discussions

FRENCH LICK, Ind.—Behavior of the oil film on the piston of an internal combustion engine was one of the descriptions presented at the fuels and lubricants session of the summer meeting of the Society of Automotive Engineers here June 4-7.

Methods and results from two photographic studies of what happens inside the cylinder of an internal combustion engine were given as a progress report to provide engineers with more exact knowledge of the performance of piston, rings, and oil film during the full cycle of induction, compression, explosion, and exhausting.

Visual studies, using glass cylinders, camera, and both scattered and fluorescent lighting, were described by M. C Shaw and T. J. Nussdorfer, of the National Advisory Committee for Aeronautics, Cleveland, Ohio. They revealed that piston-skirt lubrication is hydrodynamic for at least part of the stroke and that the amount of lubrication is a function of the relative angular positions of the piston rings and the lateral motion of the piston. They said that piston rings were observed to rotate as rapidly as one revolution per minute at engine speeds of 1,000 rpm. They estimated the oil film on the faces of piston rings to be only one-ten-thousandth of an inch thick, perhaps less.

Similar visual studies, but made without combustion in a glass-cylinder engine by S. J. Beaubien and A. G. Cattaneo, of Shell Development Co., Emeryville, Calif., were presented as helpful to designers of pistons, piston rings, and cylinders, as well as to refiners of lubricating oils, in finding the best solutions for such problems as ring sticking, scuffing, and control of oil consumption and wear.

Sudden rise in oil consumption at high speeds was found to be ascribable to a number of factors, including engine speed, normal passage of oil on exhaust strokes, movement of piston rings, loss of ring tension. It was suggested that if a major fraction of oil consumption occurs through the motion of the piston ring in its groove, anything which would hold the ring on its lower seat in the neighborhood of top dead center would reduce oil consumption.

With some attention in the United States currently being devoted to lightweight automobiles, the paper on design of European automobiles by Laurence Pomeroy, technical editor of "The Motor," London, England, received much interest.

"Economic factors prescribe that normal European cars should not exceed 2,000 lb. all-up weight," he explained, "and should be capable of at least 30 miles per gallon in day-to-day running. Improved body form will permit such cars to sustain road speeds of 70-80 mph., and this will make the small economy car increasingly competitive with larger types. This competition will be fortified by world developments in motor roads which will mask the inherent limitations of the small car in the aspects of hill climbing and acceleration."

The European car, Pomeroy said, must have a material and man-hour content not greater than one-third that of American vehicles. Increasing attention is being given to designing 1,000-lb. cars which were described as being capable of challenging American cars in speed and durability and exceeding them greatly in fuel economy. Wind tunnel tests were reported to have revealed the possibility of reducing resistance and drag by one-half to two-thirds, with resulting large gains in speed, fuel mileage, and longevity, but also to have indicated that such gains are greater with small models than with large.

E. F. Norelius, of Allis-Chalmers Mfg. Co., Springfield, Ill., declared German engineers reveal tendencies to over-design, and their vehicles are complicated in construction because limited production permits of considerable hand work. The Germans have made more progress than Americans in developing gasoline injection pumps, said R. C. Mathewson, of American Bosch Co., Chicago, Ill., but their diesel fuel injection equipment offers little that is new.

Earl Bartholomew, head of Ethyl Corp. research laboratories, predicted a 20 per cent increase in gasoline mileage within the next few years, as automotive engines are designed to take advantage of improved postwar fuels. This increase can be realized in automobile engines through combinations of supercharging and higher compression ratios, he said. Engines of compact type with stronger parts and greater rigidity were pictured to take advantage of gasoline having road octane numbers of 90 to 95.

Mileage increases ranging from 18 per cent at 65 miles per hour up to 25 per cent at 20 miles per hour were reported for an experimental passenger car engine of medium size which has been redesigned in the Ethyl laboratories. Such an advance would permit 5,000,000 additional passenger cars to operate 40,000,000,000 miles annually on the same quantity of gasoline now consumed in the United States. The spread of such a gain over the average life of 1 year's production of passenger cars would be equivalent to the discovery of a new oil field containing 500,000,000 bbl. of crude oil.

John A. Wolfe, veteran official of Sinclair Prairie Oil Co., was honored last week at a dinner in Tulsa on the occasion of his retirement after 41 years of service. Wolfe, division superintendent in the northern district for the company, joined the old Prairie Oil & Gas Co. in 1905 as a gager at Caney, Kans. The group at the retirement party is shown above. Seated—C. J. McClurg, J. S. Blair, J. T. Reeves, G. M. Most, L. C. Stratton, F. S. Gray, H. M. Coulson, A. J. Cook, J. S. Sidwell, Vic Chancellor, F. S. Cook, J. P. Moroney, H. B. Smith, J. A. Wolfe, W. L. Connelly, E. H. Chandler, J. W. Jordan, F. A. Bush, H. M. Balch, F. H. Rhees, A. J. H. Carnegie, C. L. Brown, J. H. Sidwell, W. H. Cain, H. W. Boggess, O. J. Bachman, R. M. Carr. Standing—A. E. Barrus, C. A. McNamara, H. H. Elliston, V. C. Bash, R. G. Scott, J. H. Rankin, L. J. Forche, H. C. Denton, F. G. Schmidt, V. D. Arnold, W. T. Crandall, R. S. Frazier, L. G. Rheinberger, W. O. Batson, J. W. Stoker, R. M. Gawthrop

Continuing Heavy Demand for Gasoline Brings Another Advance

by Dahl M. Duff

THE market in both gasoline and natural gasoline this week stood at fractionally higher levels after another advance under the impetus of continuing heavy demand.

The latest ⅛-cent rise in the gasoline market was the fourth in little more than a month. Most regular grade was selling at 5¾ cents on the Group 3 basis, although some smaller quantities were reported available ⅛ cent under this figure.

The natural-gasoline market took its second upswing late last week and the 26-70 grade was selling at 3¼ cents in Oklahoma. The market in North Texas was reported at 2¾ cents, although one sale of 10 cars at 2½ cents was reported near the close of the week.

One major marketer of natural gasoline described part of the improved position of the lighter product as due to its use by refiners using its greater lead susceptibility to stretch their meager supplies of tetraethyl lead as far as possible. In addition, natural gasoline was responding to the greater consumption of gasoline and heavy withdrawals from storage.

Gasoline itself is still moving well and in heavy quantities, one market observer remarked. Considerable buying by larger companies continued. Some industry officials were wondering what effect gasoline prices, now pushing back up toward ceiling in the Mid-Continent area, will have on efforts to obtain removal of oil-price ceilings.

Office of Price Administration officials have said their decision to lift controls from the industry will be influenced to some extent by the trend of gasoline prices.

In New York, price for No. 2 burning oil and kerosene was reported firm. In the Mid-Continent area, however, there were some indications of sluggishness in the kerosene market. Some large refiners were reported storing the material instead of placing it on the open market.

A slight easing of the situation in residual was indicated. This product has been in extremely short supply in practically all sections of the country for months. In New York, it was reported still tight, although stocks were building up. A slackening of activity in the steel industry as a result of the coal strike temporarily freed some residual, it was reported.

Statistics for the week ended May 25 bore out the mounting demand for gasoline with some improvement in the supply picture in other products. Daily gasoline demand in the week increased 42,000 bbl. while gasoline stocks declined over 1,000,000 bbl. for the sixth time in the past 7 weeks. Daily crude runs rose to 4,857,000 bbl.—highest since the week immediately following the end of the war. Gasoline demand reached 2,229,000 bbl. daily. Gasoline stocks dropped to 95,769,000 bbl. Kerosene production at 2,041,000 bbl. was up 57,000 bbl., while the output of heavy fuel oil gained sharply to hit 8,908,000 bbl., an increase of 488,000 bbl. for the week.

Texas Producers Group Expected to Disband

HOUSTON.—The Texas Statewide Committee of Independent Oil Producers, organized 3½ months ago to campaign for oil price control relief, is expected to disband in view of the organization of the Texas Independent Producers and Royalty Owners Association.

Glenn H. McCarthy, Houston producer, last week submitted his resignation to Olin Culberson, chairman of the Texas Railroad Commission, who named the 18 members of committee last February at the request of a group of independent producers.

Pointing out that the committee functioned primarily to work for removal of oil price ceilings or an increase in existing ceilings and that it was a temporary organization, McCarthy said its work "can reasonably and logically be taken over by the new association."

"The association," McCarthy added, "should be in an excellent position to carry on the fight of the oil men, not only against Office of Price Administration strangulation but against any other of the government controls. . . . I have every reason to believe that the committee will now disband as its primary function can be taken over in its entirety by the new organization."

Summarizing the committee's work, McCarthy said the members had distributed information relative to the oil industry, cost of production and other matters; had received thousands of letters, telegrams, resolutions, and personal telephone calls in support of its stand for higher crude prices, and had made the demands known to Congress and OPA.

DEATHS

William A. W. Krebs, 67, petroleum engineer, died May 31 at Tulsa. Krebs was associated with R. H. Hayes & Co.

M. E. Wadsworth, Longview, Tex., died recently in Longview. He had been associated with National Supply Co. for 25 years and for the last 5 years had been a trustee for the J. B. Bond estate.

John E. McKinzie, 63, district oil and gas supervisor of the Texas Railroad Commission, died May 26 in Abilene.

Stanley T. Johnson, 57, secretary to the light oil superintendent of Mid-Continent Petroleum Corp.'s refinery in Tulsa, died May 31 in Tulsa.

Dr. Arthur W. Burwell, 79, died May 24 at Niagara Falls, N. Y. Dr. Burwell was vice president and technical director of the Alox Corp. at the time of his death. In 1893 he joined Standard Oil Co. at Cleveland, Ohio, to work on petroleum refinery problems. He was considered an authority on oxidation of petroleum.

James E. Perkins, 48, died May 28 at Ponca City, Okla. He was comptroller and assistant secretary of Northern Oklahoma Gas Co.

W. L. Sluyterman van Loo, 75, associated with Royal Dutch Petroleum Co. for more than 50 years, died recently in Holland. In 1903 van Loo supervised the construction, at Rotterdam, of the first fractional distillation gasoline plant.

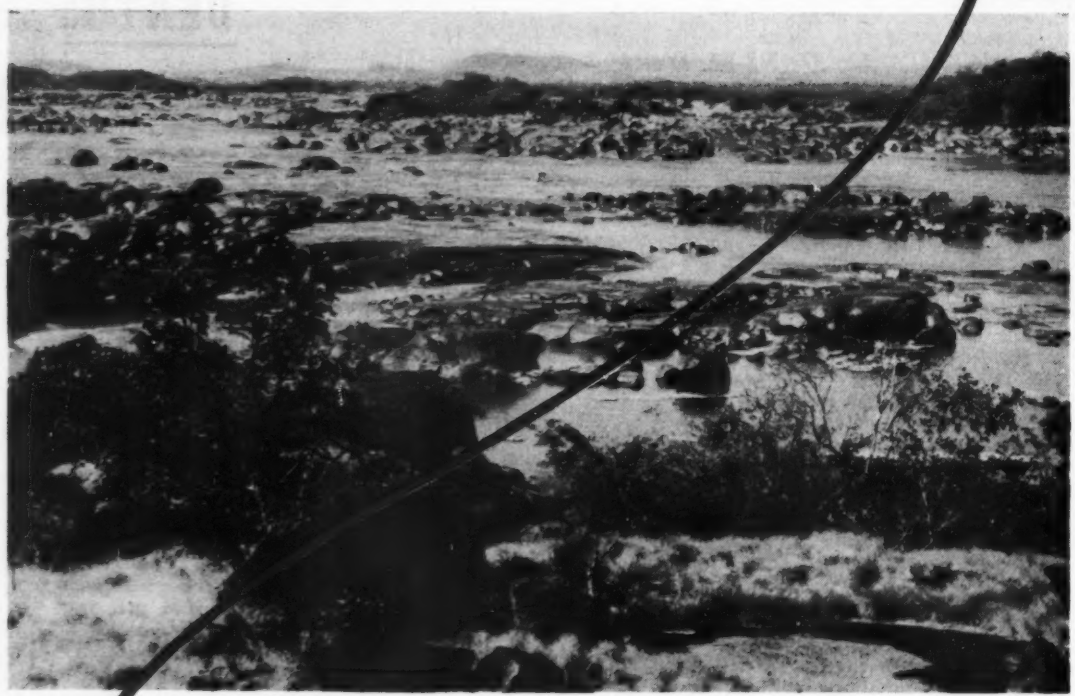
Aaron Steele, 68, retired oil operator in Mid-Continent and eastern fields, died May 28 at his home in Tulsa.

Floyd F. Stevens, 64, independent operator in the Mid-Continent area for the past 15 years, died May 28 in Tulsa.

Linden W. Crosbie, 74, retired oil pioneer, died June 3 at his home in Tulsa. Born at Sarnia, Ontario, Crosbie came to Oklahoma in 1909 and started in the oil business 2 years later, continuing until his retirement a few years ago.

Floyd F. Hardesty, 49, died May 30 at Stephenville, Tex. He was associated with the F.H.E. Oil Co. at Fort Worth.

Airborne Magnetometer



New Geophysical Tool Overcomes Jungle, Mountains, Swamps, Desert, and Water

by E. A. Eckhardt

ALTHOUGH the magnetometer was one of the first instruments used in exploration geophysics, for more than 2 decades it remained unchanged in basic principles. Indeed, except for certain improvements in details which have increased its accuracy and overall utility in field operations, it remained almost the identical instrument first taken to the field by geophysicists of the petroleum industry. It has had a varied history as regards popularity as a useful geophysical tool but, within the proper and easily recognizable scope of its capabilities, the magnetometric method remains a useful adjunct to exploratory techniques. Moreover, it is the least expensive reconnaissance method known.

These considerations led to an investigation of the possibilities of improved instrumentation with the view to remove some of the operational limitations due entirely to the design of the instrument rather than any inherent theoretical obstacles. Accordingly, more than a year before Pearl Harbor, Victor Vacquier, working at the Gulf laboratories, was engaged in the development of a magnetometer which would combine high sensitivity with truly portable operation.

For many years, saturated core devices had been known to exhibit sensitivity to superposed or ambient magnetic fields. Since such devices offered possibilities of a magnetically sensitive element having no moving parts and hence inherently independent of accelerational disturbance, they were selected for study and development. Unfortunately, however, the then-known types of saturated-core detectors were several orders of magnitude removed from the 1 gamma sensitivity desired for magnetometric work. Very early in the investigation, suitable detector elements were devised and equipment suitable for a ground-station instrument was constructed. It comprised the magnetometer element itself, mounted on a transit-type head to

A closeup of the bomb-shaped "magnetic flying eye," now being readied to work on the job for which it was originally designed, oil exploration. The "bird" is held by E. W. Westrick, an engineer who assisted in its development; while the young lady holds the cable from which it trails in flight. On the opposite page is a picture of one kind of terrain that can be surveyed for magnetic anomalies far more rapidly, and at lower cost, by the airborne magnetometer than by ground parties

BLANKETED under military secrecy regulations for 5 years, the story of the airborne magnetometer, a new tool that offers promise of low-cost geophysical work in the search for new oil fields, is told here for the first time, by Dr. E. A. Eckhardt, vice president of Gulf Research & Development Co., in an article written especially for The Oil and Gas Journal.

Many rumors and hints about this new tool have been circulating in oil circles for months. Twice previously this year, papers written by Dr. Eckhardt for presentation before professional societies have had to be withdrawn at the last minute because of secrecy regulations. There are still many technical details under secrecy regulations, but it is understood that some of these may be released in July. The Journal here gives its readers the first authoritative and authentic information Dr. Eckhardt has been permitted to make public.

Reports that the Russians had pioneered the use of an airborne magnetometer have proven true. However, it is now revealed that the instrument developed and used by the United States during the war had an accuracy of measurement 1,000 times as great as the Russian instrument. The degree of accuracy of the Russian instrument was hopelessly inadequate for use in geophysical work in the search for new oil fields.

permit accurate manual alignment in the desired orientation, together with the necessary auxiliary electronic equipment and field intensity indicator.

This device had the basic properties required for a successful airborne magnetometer and moreover, it had immediate usefulness in a number of military applications. In particular, it offered hope of detecting submerged submarines from the air.

In February 1941, it appeared desirable to make some preliminary experimental flight tests, partly for the purpose of obtaining some first-hand information regarding the nature of the roll-and-pitch motions of the aircraft and particularly to crystallize ideas concerning the most useful means of exhibiting the magnetic anomalies traversed. The development was called to the attention of Preston R. Bassett, now president of Sperry Gyroscope Co., who displayed interest and offered the facilities of their flying laboratory to flight-test the instrument. The flight test was made in the latter part of the same month, and the results were regarded as very encouraging by all who participated in the tests. Among other things, the clear correlation of the magnetometer readings with the geology and culture of the terrain traversed was evident.

All who participated in this flight test believed, at the time, that they had witnessed a pioneering achievement—the first flight of an airborne magnetometer. It has since been learned that a Russian geophysicist, A. Logachev, made such flights in 1936. However, Logachev used equipment already well known and used for surveys on the ground, mounting it on gimbals to maintain approximate vertical orientation in the aircraft. The sensitivity achieved was about 1,000 gammas, which is far removed from the 1-gamma sensitivity necessary for geophysical prospecting. On the other hand, Vacquier's instrument was especially designed for ultimate adaptation to aircraft use, and its attainable sensitivity was well within requirements — at least 1,000 times greater than that used by the Russians.

In view of the encouraging results in the Gulf-Sperry flight tests, the development of this type of magnetic

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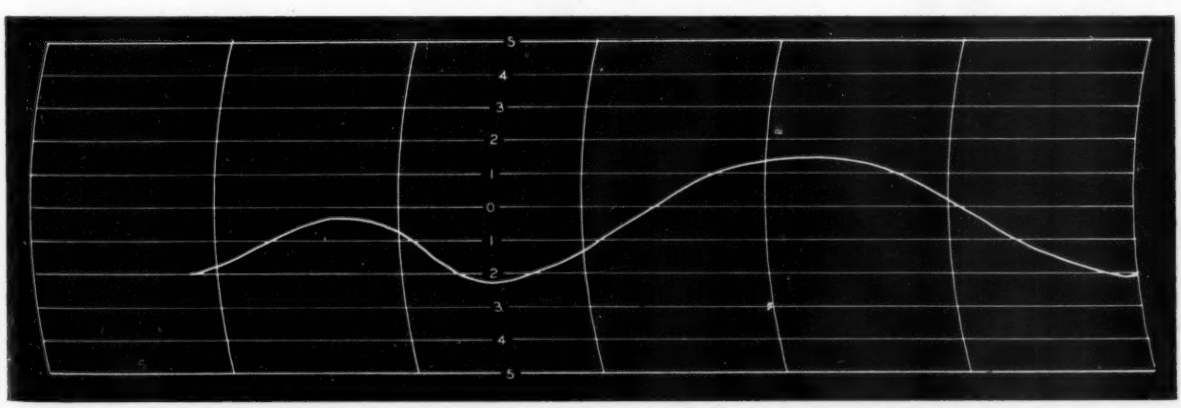


Typical profile recording, similar to those obtained by use of an airborne magnetometer

Plastics Demonstrate Value in Plugging Back East Texas Wells

by George Weber

This article analyzes the types of East Texas wells which have been reworked with the new plastics method to shut off water. It shows the results for the period 1943-1946, and tells how the treatments are made. Methods of squeeze-setting blank and slotted liners with plastics are diagramed.

INCREASING salt-water production and the continuous need for remedial work on oil wells has made the East Texas field an important proving ground for materials and methods used in plug-back work. Since plastics were first introduced for that purpose in the field 3½ years ago, several new types and means of employing them have been developed.

To May 1946, nearly 58,000 gal. of plastic were used in a total of 1,888 plug-back jobs completed in the field. The total includes wells previously plugged back. Of the wells so worked, 50 per cent were making less than 30 per cent salt water immediately before plugging and 25 per cent were in the 80-100 per cent salt-water class. Fig. 1 illustrates the breakdown of wells plugged back with plastic in East Texas.

As shown in Fig. 2, plastic plug-back work increased rapidly during late 1943 and reached a peak in 1944, with 114 wells reworked in the record month of April of that year. Work has since declined to a current average of about 30 jobs monthly.

Over a 40-month period ending March 1, 1946, 62 per cent of the plug-back jobs employing plastic succeeded in shutting off all water. A total of 300 jobs, or 15.9 per cent, resulted in partial reduction in water production and 360 or 19.1 per cent failed to improve the oil-water ratio.

Subsurface Information Important

While the cost of the plastic material itself may perhaps be considered relatively high, proponents of the method say this increased cost is offset by shorter down time required by plugging in one continuous operation, and that plastic affords good penetration, a firm bond, and flexibility in handling. But aside from these advantages its success is subject to the same factors governing all such remedial work; the information made available to the service man regarding subsurface conditions in each well.

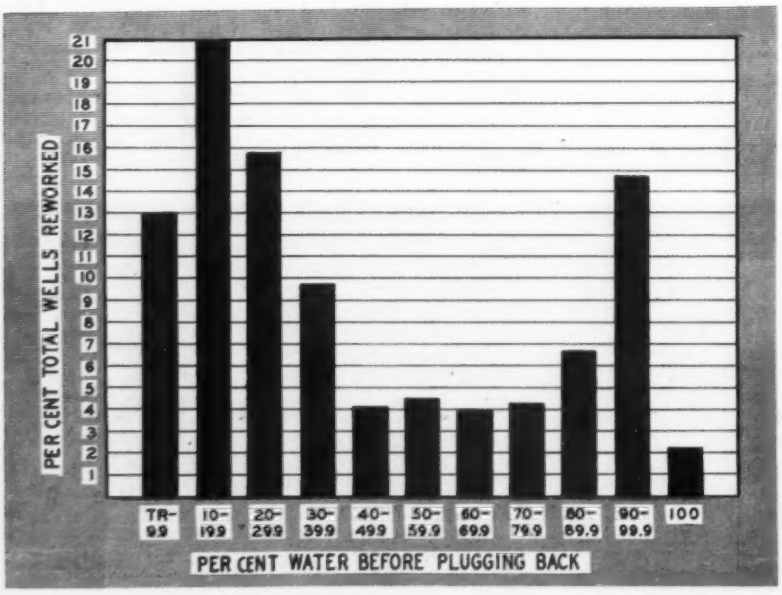


Fig. 1—Classes of water wells plugged back with plastic in East Texas field

The use of such tools as the gamma ray, water locater, and electric log in subsurface well study, has greatly increased the probability of successful water shutoff, particularly where water is present in intermediate or top sections of the producing zone. Improved technique is reflected in the record of the year ending March 1, 1946, when 70 per cent of all plug-back work produced pipe-line oil, as compared with 59 per cent complete success in work prior to March 1, 1945. Water percentages of wells plugged back during this latter period conformed to the over-all average, but top water was found in an increasing number of wells, increasing the difficulty of remedial work.

Plastic Types Available

In contrast with the single plastic used in original work in the field, a total of five types of straight plastic, and several specialized products are now available. The use of catalysts for control of setting time, and fillers for penetration control is now universal. The straight plastics employed with catalysts and fillers may be employed at formation temperatures ranging from 55°-320° F. For use in East Texas, where formation temperature is approximately 145° F. setting time may be varied from 1 to 24 hours.

The type of plastic most commonly used has a specific gravity of 1.2 and a viscosity range from 180 centipoises at 80° F. to 30 centipoises at 150° F. At formation temperatures it will penetrate the formation as readily as oil. Added filler in varying proportions gives the plastic a penetration range of from ½ in. to 6 in. Experiments have revealed that the proportion of filler is the only important factor in penetration control, since pressure differential and sand permeability have little effect on the position of the filter cake forming in the oil or water sand. A penetration of 1 in. is commonly employed in setting liners for perforation, and plastic is allowed to penetrate 2 to 3 in. in plugging water sections in open holes. Recent gun-perforator tests showed a perforation of 8 in. in solid plastic, but no tests have been made in East Texas on perforation of sand consolidated with plastic. The plastic bonds firmly to metal, cement, and

sand and is not affected by oil or salt water. On a strength test, a 4-in. plastic plug in a 1-in. nipple was subjected to 4,500 psi. without shearing.

Other available plastics include a water-soluble product mixed with a cementaceous filler, a straight plastic-cement mix, and two types of plastic for use in wells penetrating soft oil sands. One of the latter products is pumped into the formation between slugs of diesel oil, coating and cementing the sand grains but leaving the body porous and permeable. The other plastic sets up as a permeable plug through which the well may be produced.

Methods Employed

The dump-bailer method is still used in most plastic plugging in East Texas, but use of tubing strings to run plastic under pressure is increasing. Plastic is now used in plugging open holes and perforated casing and in setting blank and slotted liners. Selective plugging is done with sand gravel or cementaceous bridges. Since the plastic must penetrate the sand face, a clean hole is necessary, and oil is largely used in conditioning a well before plugging.

Salt-Water Intrusion

A large percentage of wells in East Texas were completed in, or plugged back to the top of the main sand body under the assumption that the water contact would displace vertically at the rate of 3 ft. per year. The resulting heavy withdrawal of oil from the top of the section, coupled with the presence of shale breaks, near the top of the pay, has caused a lateral intrusion of water at intermediate and top levels of the producing formation. This action is most pronounced in the south end of the field, centering in the Cordova Survey, and similar conditions have been reported in the north end of the field. Wherever heavy withdrawals have been made near the top of the pay, such water intrusion may be expected.

Remedial work on such wells calls for deepening, if necessary, and setting liners for selective perforation according to well-log data. It is estimated that 50 per cent of plug-back work will employ liners by the end of this summer. Drillable liners and shoes to allow later deepening are due for probable future use.

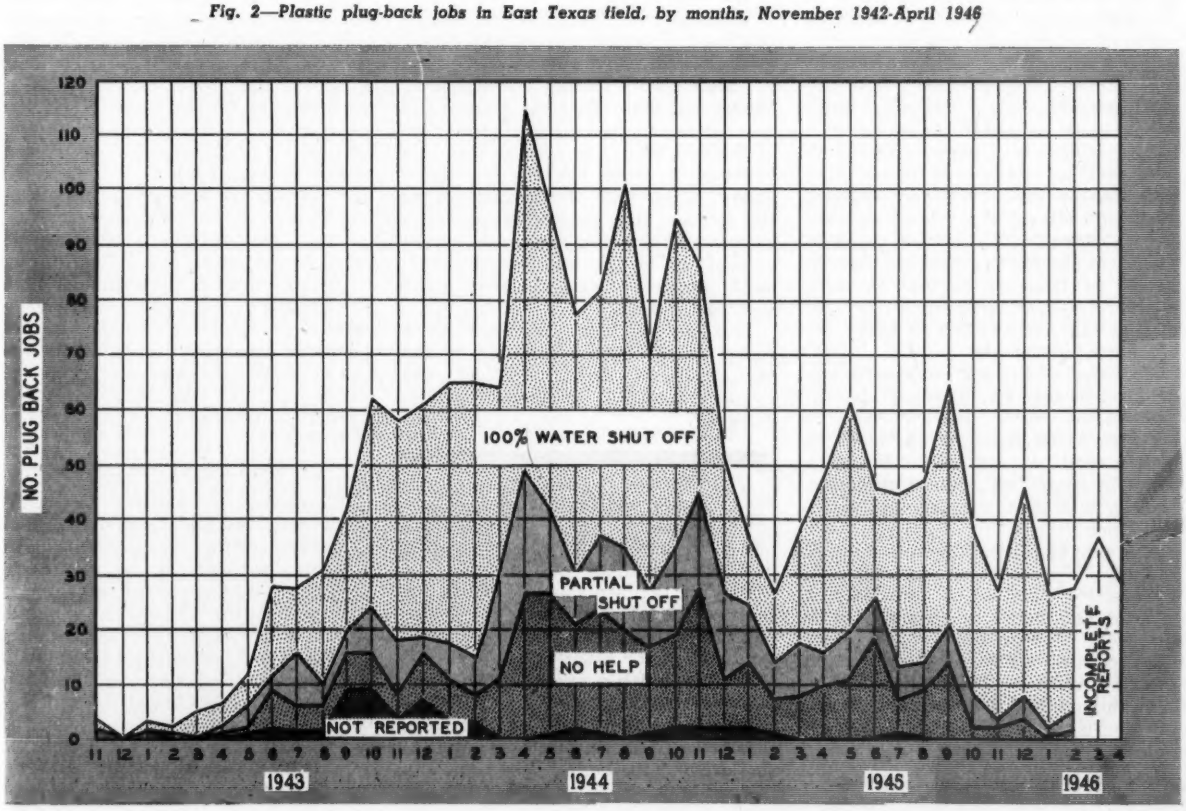
Plugging Bottom Water

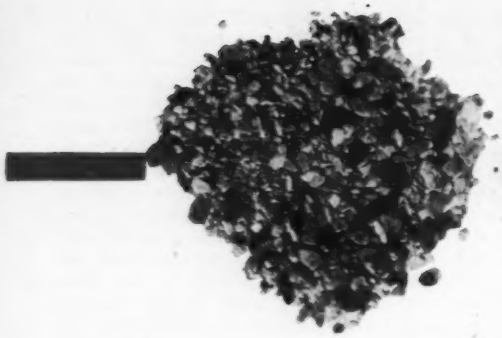
Presence of bottom water alone in an open sand section presents the simplest problem for a plastic plug. The trend is to plug off less oil section on bottom than formerly, since successive plugging as the water rises may be accomplished in a short time without need for workover rigs. Generally, the plug is set 5 ft. above the water section, or to the nearest shale break.

In such wells, tubing is pulled and the well thoroughly cleaned, usually with a hydrostatic bailer. The hole is then logged to locate the oil-water contact and any shale breaks. If the open hole is suspected to be of large diameter due to sand caving, it is well to run mechanical calipers to determine the volume of the plug required. This is an economy measure, allowing substitution of gravel, sand, or other fill for more costly plastic in the bottom of the plug. Such materials are used to fill the bottom of the hole without mixing with plastic, and are not to be confused with fillers which are added to the plastic to control penetration. In general such fills are used in wells requiring a plug of 10 ft. or more. When gravel is used, it is capped with 3 to 4 gal. of fine sand to prevent plastic intrusion. The plastic is then dumped as a cap on top of the fill by a bailer equipped with a positive displacement piston actuated by jars. The plastic level is brought to a point just below the desired plug level and a bradenhead squeeze of 500 psi. is applied for 30 to 40 minutes. Additional plastic is then dumped to make up that squeezed into the formation, and to bring the plug to the desired height. The squeeze is repeated and more plastic dumped to the plug level if necessary. Throughout the operation, a thief run on a wire line is used to determine the top of the liquid plastic. Such staged dumping and squeezing

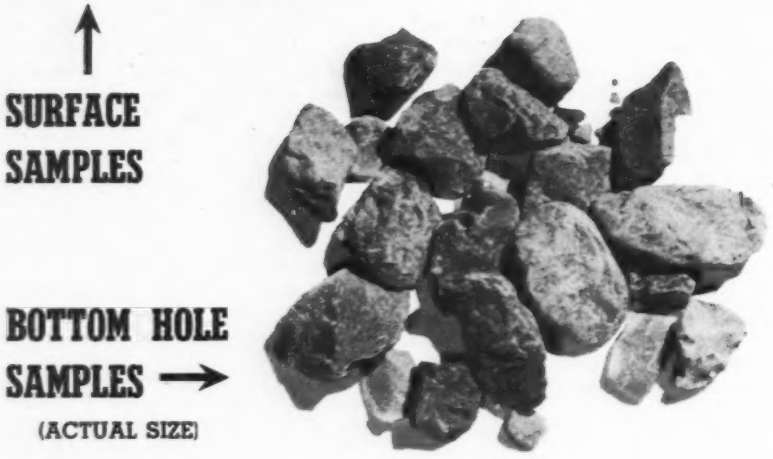
(Continued on page 88)

Fig. 2—Plastic plug-back jobs in East Texas field, by months, November 1942-April 1946





PENETRATION Rates in Hard Formation Drilling



by J. E. Warren and R. B. Schabarum**

THE maintenance and extension of the nation's oil reserves requires the drilling of deeper and more costly wells. A recent and substantial addition to reserves has resulted from development of the Fullerton field, West Texas. Ragland† has shown that well costs below a depth of 5,000 ft. in West Texas increase at an alarming rate. On the basis of 40-acre spacing, average well costs per acre increase from $1,250 at 5,000 ft. to as much as $7,000 at 10,000 ft., and $10,000 at 12,000 ft. This means that per-acre recovery of deep fields must increase in that same proportion to make development attractive.

The costs of drilling deep wells can be divided into two distinct classifications:

1. The costs necessary actually to drill a well.

2. The costs of well completion, testing, and procuring geological information.

The first classification amounting to roughly 75 per cent of the total cost, is largely controlled by location and type of equipment necessary to drill the well. The greater proportion of these drilling costs are dependent on the time element; labor, depreciation of equipment and drill stem, overhead, mud, repairs and replacements which increase directly with the days required to drill a well. The application of drilling methods which result in a saving of drilling days results in a saving of total cost. This time factor can be expressed as rate of penetration in feet per hour.

Factors which control the time necessary to drill a well are: (1) The character of the formations and the formation fluids encountered, and (2) the drilling methods.

Evaluation of formation characteristics often is impossible while drilling a wildcat well. The usual procedure is to drill with the highest degree of protection at all times. This is one of the chief reasons wildcats are much more costly than subsequent wells drilled in the same area. If the drilling of a wildcat well results in production and further drilling is indicated, then an evaluation of formation characteristics will show speedy returns. The study should be made from the standpoint of determining a drilling program that will result in the lowest over-all cost. The casing pattern should be designed to afford adequate protection against blowouts and other well hazards, to reduce the use of costly drilling mud, and allow the drill to make a maximum amount of hole.

THE theory has been advanced that cuttings are sized down by rotary bits on the bottom of the hole while drilling with conventional circulation . . . double work for the bit. A regular basket sub was run above the bit so that cuttings just leaving the bottom of the hole would be caught. Cuttings collected in these baskets are shown above, along with those collected at the surface. It is concluded from this experiment that the large cuttings are ground up in the annulus by drill-collar and tool-joint action against the wall of the hole.

This article was presented as a paper at the spring meeting of the Mid-Continent district, Division of Production, A.P.I., at Oklahoma City, June 6-7.

Drilling Technique

The methods employed while drilling a well are most important, because they afford considerable latitude to the operator in application of judgment and experience.

It is recognized that rate of penetration is influenced by the following: (a) type and size of drill stem including drill pipe, drill collars, reamers and bits; (b) speed of rotation; (c) amount and manner of applying weight to the bit; (d) size of hole drilled; (e) rate of circulation and character of drilling fluid; and

*Carl B. King Drilling Co.

†Douglas Ragland, "Drilling Equipment Needs," Drilling Contractor, November 15, 1945.

(f) efficiency of supervision and drilling crews. There is a marked relationship among these factors, and they must be varied to meet different conditions for maximum efficiency.

During the development of the Fullerton field, the authors had an opportunity to study the influence of the above variables on rates of drilling hard dolomites and limestones (Fig. 1), under comparable conditions. Subsequent and deeper wells drilled in other areas confirm the experiences and observation of authors at Fullerton.

During the early development, it was the practice to set an intermediate string of casing at 2,850 ft., more or less. Salt stringers encountered below this point made it necessary to use a starch type of mud. In order to avoid stuck drill pipe, the water-loss characteristics of the mud had to be low. Increasing the length of the intermediate string to 4,000 ft. in order to case off all salt formations allowed the use of water as a drilling fluid below the intermediate string. Fig. 2 indicates results of drilling five wells with mud and Fig. 3 indicates average results of a group of five wells which were drilled with water. In constructing the drilling-day curves, time lost due to unusual conditions such as fishing, extra rigging up, etc., has been excluded. For convenience in comparing drilling time, a comparative chart has been prepared (Fig. 4). Other variables such as weight and rotary speed were quite similar in both groups, and the difference in bit efficiency and rate of penetration is directly attributed to the differences in drilling fluid used. In this instance the advantage of using water is obvious.

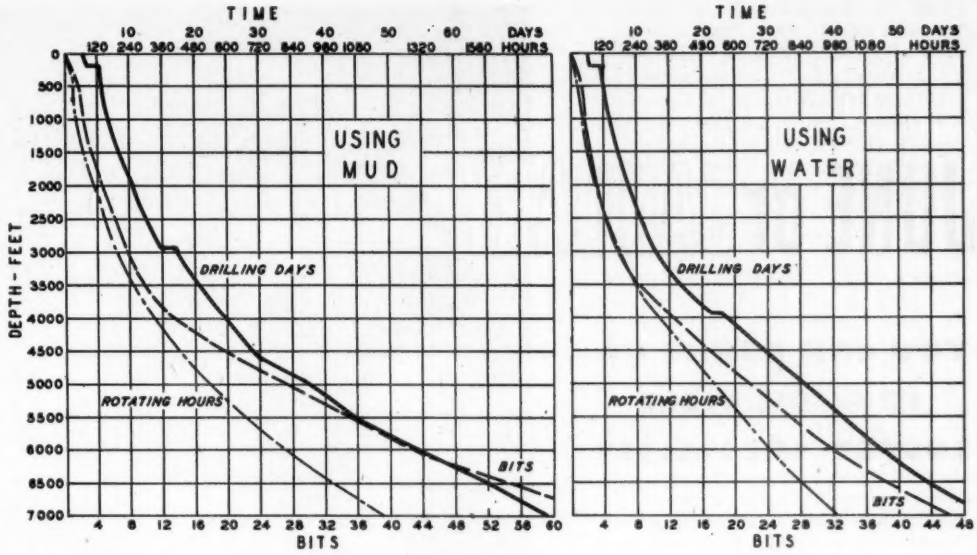
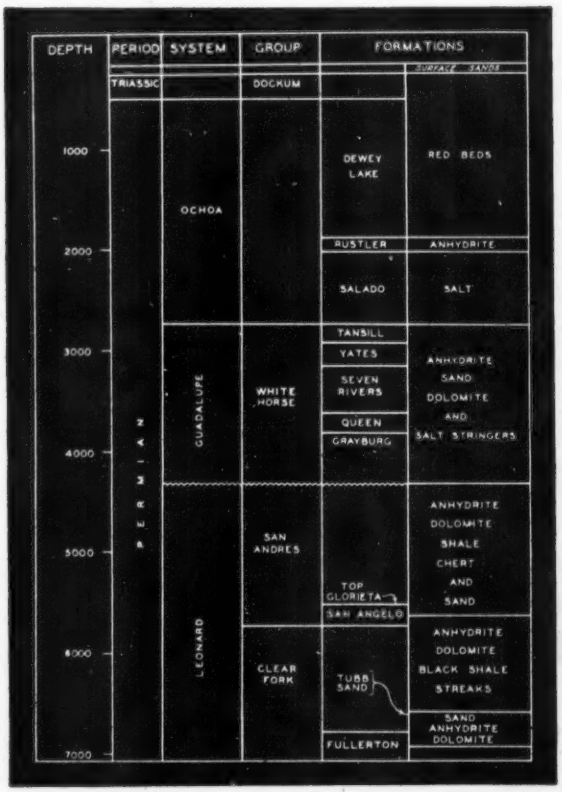


Fig. 2—(Left) Drilling-performance curve, 8,000-15,000 lb. bit weight (five-well average). Mud used as circulating fluid; 2,800-ft. intermediate casing string. Fig. 3—(Right) Same, but another five-well average where water was used; 4,000-ft. intermediate casing string

Fig. 1—West Texas (Fullerton pool) geologic section



The dominant characteristics of drilling fluid which affect the rate of penetration while drilling hard formations are viscosity and water loss. The rate of circulation of drilling fluid required for maximum efficiency in drilling hard formations is not as great as that needed in drilling softer formations. In hard formations, hole enlargement is not serious. Due to comparatively low rates of penetration, the relatively small volume of cuttings is satisfactorily carried to the surface when the annular velocity exceeds 2 ft. per second.

It has been the custom of many companies in drilling the pay section to reverse the normal circulation procedure and pump the drilling fluid down the annulus so as to bring the returning fluid and cuttings to the surface inside the drill stem. This procedure results in much larger drill cuttings than were normally recovered by conventional circulation. The theory has been advanced that cuttings are sized down by the bit on the bottom of the hole while drilling with conventional circulation. This action would mean double work for the bit and would result in inefficiency of bit action. In order to determine where the large cuttings were sized down, a regular basket sub was run above the bit so that cuttings just leaving the bottom of the hole would be caught. Five different runs were made in this manner with an additional basket placed to collect cuttings at intervals of 600 to 3,400 ft. above the bit. Cuttings collected in these baskets were compared with those collected at the surface. The results of these test runs are shown in the accompanying table. The difference in cutting size is illustrated at the beginning of the article.

It was concluded from this experiment that the large cuttings are not reworked on bottom by the bit, but

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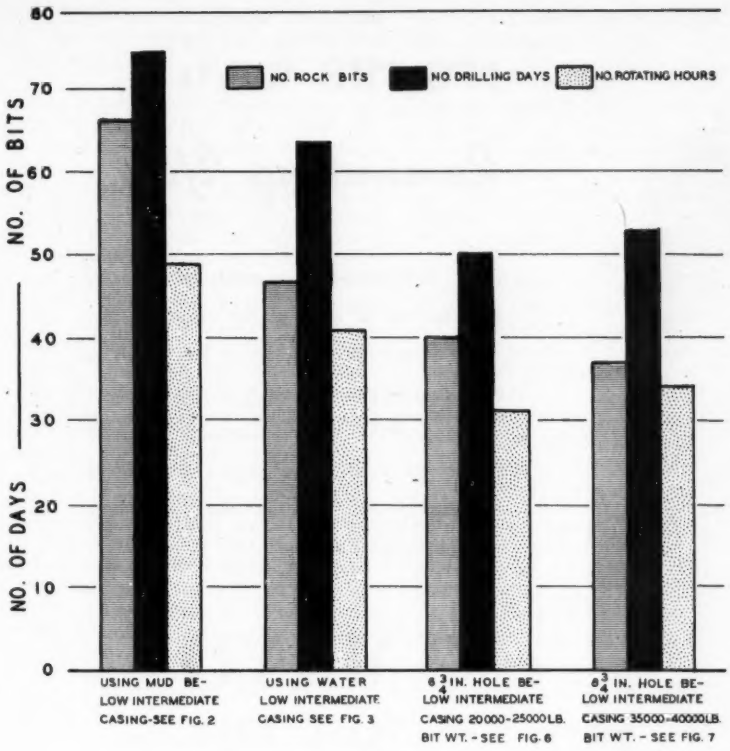

Fig. 4—Graphic summaries of the different "drilling-performance" test wells (from Figs. 2, 3, 5 and 6)

are ground up in the annulus by drill-collar and tool-joint action against the wall of the hole. It is probable that the large cuttings travel quite slowly in their upward course, until they are broken up in smaller sizes.

The action of a rock bit in drilling is for each tooth to penetrate the formation and break out chips or rock. The ability of a bit to perform this action most efficiently depends upon: (1) the spacing, number and shape of the teeth; (2) the quality of the metal and bearings which have to withstand the stresses and abrasion imposed on the bit; (3) the weight applied and speed of rotation, and (4) the circulating fluid which keeps the bit lubricated and clean.

The resistance of a formation to tooth penetration depends on its hardness. In order to get efficient tooth penetration in the harder formations, it is necessary to apply greater weight to the tooth and give it sufficient time adequately to penetrate the rock.

The application of weight to a drilling bit must be done through the compression of drill stem immediately above the bit. In order to get efficient penetration weights, as much as 40,000 lb. must be applied to 8¾-in. bits and 25,000 lb. to 6¾-in. bits. If this weight is applied by means of drill pipe alone, it would require approximately 2,760 ft. of 4½-in. drill pipe in compression to attain 40,000 lb. of bit weight. The compression of this amount of drill pipe will bend it so that a considerable amount of the weight will be supported by the walls of the hole and will be ineffective for bit weight. The use of multiple collars will concentrate the bit weight in a shorter, more rigid section above the bit and reduce the loss of weight to the wall of the hole. Collars of 6¼-in. size weigh approximately 78 lb. per ft., and every foot of collar will furnish approximately as much bit weight as 5½ ft. of 4½-in. drill pipe.

Use of Long Drill Collars

The method of applying weight to the drill bit by means of drill collars has been common practice for many years in soft formation drilling. Usually from 30 to 120 ft. of drill collar will furnish the required bit weight in that type of drilling. Previously, the use of multiple drill collars had been tried and the practice discontinued in hard-formation drilling because of breakage occurring in

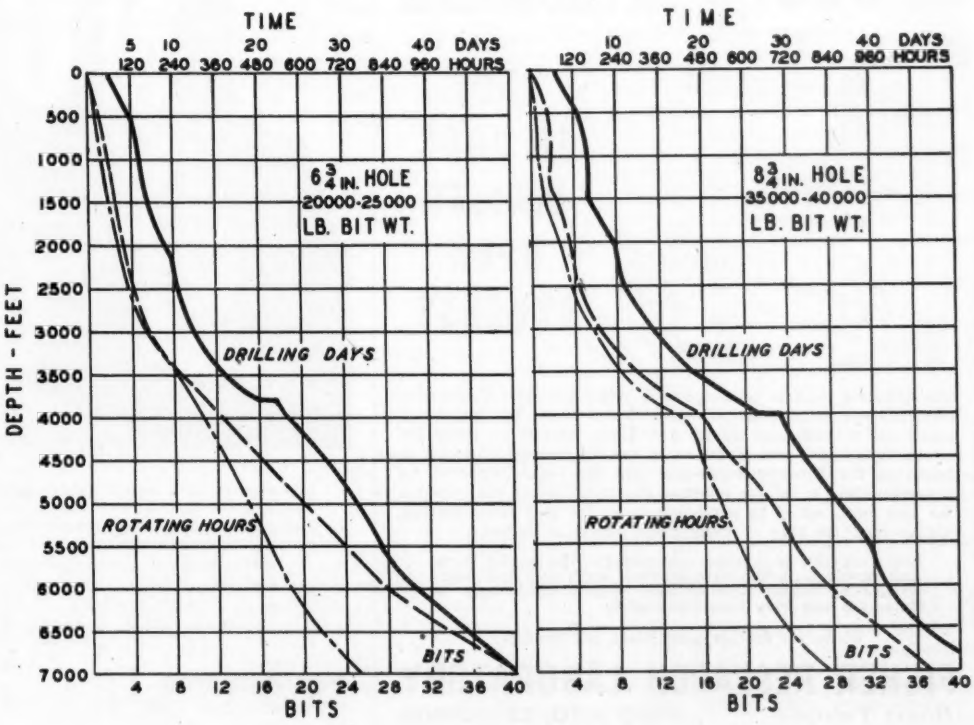

Fig. 5 (Left) and 6 (Right) — Drilling-performance curves. The hole sizes shown are those below the 4,000-ft. intermediate casing strings (5-well averages)

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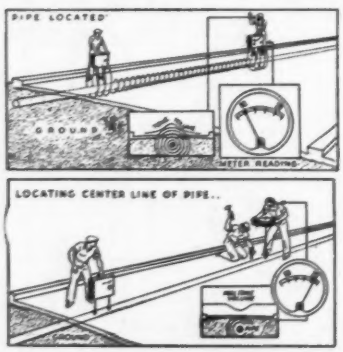

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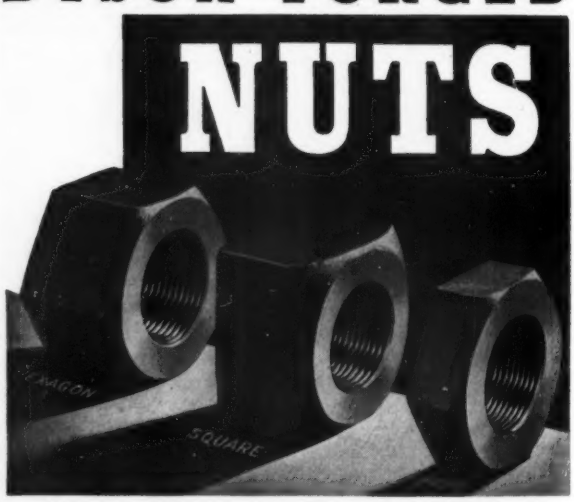

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the drill-collar tool joints. A column of drill collars, although heavy and rigid will flex to the wall of the hole and the centrifugal force of high-speed rotation will result in a whipping action of the collars and the application of considerable lateral stress on the drill collar tool joints. These stresses can be minimized by decreasing the speed of rotation. Where it is feasible to drill with a rotary speed not to exceed 65 to 70 r.p.m., as much as 600 ft. of drill-collar section is being run with very little trouble through breakage of drill-collar tool joints. The small amount of trouble developed is more than compensated by the reduction of trouble in the drill pipe section of the drill stem.

Referring to Fig. 4, which is a comparison of Figs. 2, 3, 5, and 6, it can readily be seen that considerable improvement was made in bit performance and rates of penetration by utilizing heavy bit weight and slow speed rotation.

Slow rotary speeds will, in some formations, allow the bit to deviate from vertical and for this reason frequent slope tests should be made. When it is difficult to keep a hole straight, a compromise must be made by increasing speed of rotation and reducing bit weight and accept a reduction in rate of penetration.

Hole Size

There has been considerable difference in opinion as to the proper size of hole that in the over-all analysis will show the greatest return to the operator.

The arguments in favor of small hole drilling are:

1. Economy in casing costs.
2. Economies in mud and cement due to reduced hole volumes.
3. Reduction of drilling costs due to use of small drill stem, bits, and rotary drilling equipment.
4. Greater rates of penetration are obtained in many cases.

The arguments against small hole sizes are:

1. Prevents the use of an extra string of casing if required.
2. Reduction of annular clearance between casing and hole.
3. Small clearance for purposes of fishing.
4. Lesser rates of penetration are obtained in many cases.

The arguments presented against small-hole drilling in the Permian Basin area have been largely dispelled by experience. Many long strings of small size casing have been successfully cemented with collar clearances of 0.3 in., and pipe clearances of 0.62 in. Fishing tools, wash-over pipe, etc., have been designed so that hazards of fishing are not greater than those encountered in larger holes.

It is often necessary to drill a large hole for dual-completion purposes or for accommodation of an extra string of casing in wildcat wells.

Where the larger hole is unnecessary, as is the case with most wells, then the small hole pattern will show many economies.

Hoisting capacity is generally the depth limiting factor of rotary rigs in hard formation areas. The hoisting capacity of rigs is increased approximately 25 per cent for hole sizes requiring 3½-in. drill pipe and 5¼-in. drill collars over those holes requiring 4½-in. drill pipe and 6¼-in. drill collars.

Comparisons were made between 8¾-in. size hole and 6¾-in. size hole where 4½-in. drill pipe was used in the larger hole and 3½-in. drill pipe in the smaller hole. The results are shown in Fig. 5 and Fig. 6. In Fig. 5, 9⅞-in. diameter hole was drilled to set 7⅝-in. intermediate casing at 4,000 ft. and 6¾-in. hole drilled for the oil string. In Fig. 6, 12¼-in. hole was drilled to set 9⅝-in. casing at 4,000 ft. and 8¾-in. hole drilled for the oil string. The curves show that drilling 9⅞-in. hole was faster and fewer bits were used than was the case in drilling 12¼-in. hole. The 8¾-in. hole, however, drilled approximately the same as the 6¾-in. hole. The net results in these comparisons show little difference in penetration rates over the entire hole. Where it is necessary to penetrate harder formations to accommodate an intermediate string of casing, small hole patterns have considerable advantage.

The larger rock bits cost approximately 20 per cent more than the smaller size and drill-stem depreciation is approximately 25 per cent more for drill stem required to drill the larger hole.

Acknowledgments

The authors wish to thank Stanolind Oil & Gas Co., J. W. Graybeal, Ronald DeFord, and staff of Carl B. King Drilling Co.

DRILLING SAMPLE DATA ATTACHMENT—UNIVERSITY "O" NO.3 FULLERTON "8500" FIELD

	Sample "A"	Sample "B"	Sample "C"	Sample "D"	Sample "E"
Interval drilled	4143-4298	4298-4563	7035-7109	7109-7192	7732-7772
Rotary speed	42	42	43	43	42
No. of drill collars	20	20	19	19	20
Weight on bit	30,000#	30,000#	40,000#	40,000#	30,000#
Pump pressure	800 psi.	800	800	800	800
Pump data:					
R.p.m. (average)	37	37	36	36	36
Length stroke	18"	18"	18"	18"	18"
Liner ID—inches	7"	7"	7"	7"	7"
Gal./min. delivery (97%)	431	431	419	419	419
Velocity in annular space ft./min.	188	188	182	182	182
Cutting travel time to surface in minutes	22	24	39	39	43
Mud data:	(Water)	(Water)			
Weight-lb.	.....	.....	9.2	9.0	8.9
Viscosity—sec.	.....	.....	34	36	36
Water loss—c.c.	.....	.....	6	7	8
Formation drilled	Anhy. and dolomite	Anhy. and dolomite	Dolomite	Dolomite	Lime
Size and type baskets	7" & 6½" Reed Bas.	7" & 6½" Reed Bas.	7" Reed	7" & 6¼" Reed	7" & 6½" Reed
Spacing between baskets	600'	600'	.....	3400'	4530'
Depth from surface to upper basket	3543-3698	3698-3963	.....	3635-3709	3202-3242
Sample data:					
Bit basket samples	Med. size cuttings Mostly dolo. Some anhy. and shale	Med. large dolo. cuttings. 2 extra large flakes.	Large dolo. cuttings Very large shale flakes	Very large dolo. and shale cuttings	Very large shale. Med. lge. dolo.
DP basket samples	Small size mostly anhy.	Small cuttings Mostly anhy. trace shale and dolo.	None	Med. sized dolo. and shale	Med. sized lime and dolo.
Surface samples	Approx. same size as above. Mostly dolo.	Small cuttings mostly dolo.	Med. small dolo. cuttings	Slightly smaller than above. Mostly dolo.	Slightly smaller than above.

Plastics Demonstrate Value in Plug-Back Work

(Continued from page 81)

assures penetration along the full section and prevents coating of the sand face above the top of the final plug. Setting time is fixed to exceed maximum dumping time, so that the plug is uniform. The average job of this type requires from 6 to 8 hours.

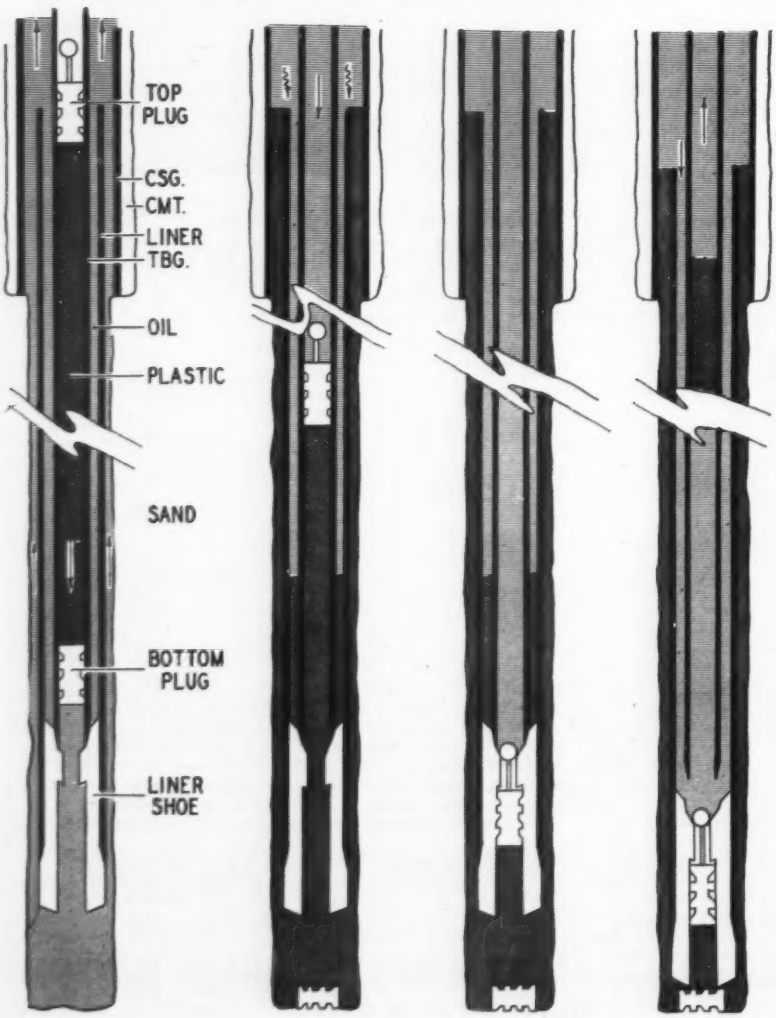
Squeeze Setting Blank Liners

About one-third of the wells currently plugged back are being set with blank liners, with the percentage increasing. This practice is followed generally when open producing sections exceed 10 ft. and particularly where intermediate or top water is present.

Fig. 3 outlines the steps of the method. Sufficient liner to extend above the casing seat is made up on a special liner shoe adapted for plastic work. The tubing string is coupled by reverse threads into the top of the shoe, and the liner and shoe are run to the bottom of the hole on the tubing. A rubber cleaning plug inserted in the bottom section of tubing is forced up the string by the weight of the annular oil column as the string is run, and is kicked out the top of the completed string by a slight pressure applied to the casing. This assures a clean tubing, free of obstructions.

Sufficient plastic is mixed to more than fill the annulus outside the liner, plus 1 gal. per ft. of formation for penetration. Oil is circulated in the tubing, and the bottom rubber plug is inserted followed by the measured plastic and a top rubber plug with metal ball attached. The plastic slug is displaced with oil down the tubing string between the two plugs until the bottom plug reaches the seat in the liner shoe, Fig. 3(a). Location of the bottom plug is clearly indicated at the surface by the 1,000 psi. pressure required to force it through the restricted throat in the shoe. Following its passage, enough plastic is displaced through the shoe to bring its level to the liner top. Excess plastic, because of its weight, spills into the liner and displaces oil at the bottom of the tubing-liner annulus, Fig. 3(b).

Fig. 3—Squeeze method for setting blank liner with plastic



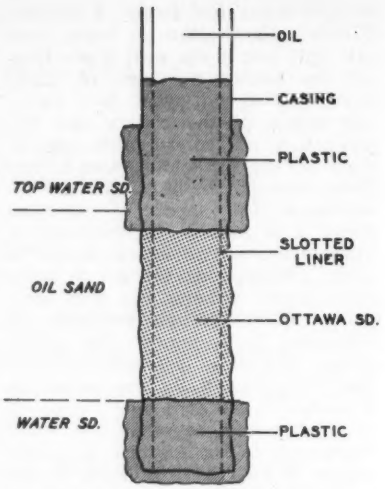


Fig. 4—Setting slotted liner to plug off top and bottom water

At this point, the casing valve is closed and the plastic remaining in the tubing string, amounting to the gallon per foot of open hole, is pumped through the shoe against casing pressure displacing a like amount into the formation. Pumping rate for the additional plastic is slowed to 5 g.p.m. to assure uniform penetration into the sand face. Casing pressure is bled off to 500 psi. during this operation. When the top plug seats in the liner shoe, it shuts off circulation in both directions. Proper setting of the plug is tested first by bleeding casing pressure. If the tubing pressure remains constant the rubber plug is properly seated against the bottom of the throat. The tubing pressure is then released and sustained casing pressure shows proper setting of the ball in the tapered top seat of the shoe, Fig. 3(c).

The liner string is then set on bottom and the tubing backed off 1 ft., Fig. 3(d). Reverse circulation clears all excess plastic from inside the liner. As soon as the plastic has set, the well is ready for perforation.

The restriction in the liner shoe measures 1¼ in. for 2-in. tubing. Drillable shoes of magnesium are now available when deepening inside the liner is contemplated. A short string squeeze may be made against a packer if the operator does not wish to squeeze against the casing.

Setting Slotted Liners

Many slotted liners already in place in wells have been set successfully with plastic. In such work it is important that the liner and annulus outside be thoroughly cleaned before plugging. This is done with a liner

washer or hydrostatic bailer. For bottom water, the plastic plug is set the same as for open hole.

For wells suspected of making intermediate or top water, the gamma ray is used to determine what sections should be plugged. Use of this log precludes the necessity of a costly pulling job on the liner. If bottom and top water is present, the bottom plug is set with a dump bailer and squeezed in the usual manner. Fine sand mixed with water is then dumped on the set plug to the level desired for the top plug. While dumping the sand, the bailer is spudded up and down in the hole, forcing sand through the slots to fill the annulus between liner and formation.

The plastic plug is then dumped opposite the top water section and squeezed with 500 psi. (Fig. 4). After the top plug has set, it can be drilled through at the rate of 2 to 3 ft. per hour with a hydrostatic bailer. The sand bridge is then bailed out of bore and annulus and the well is ready for production. The same method is used for plugging water sections opposite perforated casing.

Drillable Liners

Plug-back work employing blank Transite liners is planned where wells may require future deepening. This type of work is designed for wells requiring short strings. The Transite liner with a 1-ft. plastic bull plug at the bottom is filled with sand before running in the hole. Plastic, filler, and catalyst are mixed at the well and dumped continuously with a 10-gal. bailer. The amount of plastic is carefully computed to equal the volume of the annulus between the liner and the open hole. As soon as the plastic has been dumped, the liner is run in the hole on a bailing line and released as it reaches bottom. A bradenhead squeeze is applied. After the liner is set, the sand is washed out by reverse circulation and the well is ready for perforation.

Airborne Magnetometer

(Continued from page 79)

detector for several military purposes was immediately stimulated. Gulf was supported thereafter by National Defense Research Committee contracts to develop several military applications including an airborne magnetometer for submarine detection.

One result of the first flight test was to make increasingly evident, the very precise orientation stabilization required for the magnetometer element if the full sensitivity capability of the device was to be realized. In attacking the stabilization problem, the time factor was a paramount consideration since the submarine problem was becoming more serious each day and those working on defense measures were under corresponding pressure. Moreover, the need was immediate to demonstrate conclusively that a properly and automatically stabilized instrument could, in fact, exhibit signals of such nature as to indicate, with reasonable certainty, the presence of a submerged submarine within a practicable search distance of the traversing aircraft. Thus, of the primary methods of stabilization suggested in Gulf's early work, expediency seemed to warrant at least the temporary adoption of the simplest possible scheme in order that a practical demonstration of submarine detection might be made in the shortest possible time.

About June 1941, the first automatically stabilized instrument was ready for flight. A little later in the year an instrument having a satisfactorily low "noise" level was flying in a Navy P.B.Y. This instrument was later transferred to a Navy blimp and under a secret security classification was in service use from December 1941 until late in 1942. Early in January 1942, the successful service operation of this type instrument led to a Navy directive for the immediate construction of additional instruments without further loss of time in additional development except such changes as could be incorporated without delaying the construction program. In accordance with the directive, while a sufficient number of the devices were under construction to equip the then-available blimps urgently needed for coastal submarine patrol, further research at the Gulf laboratory had to be postponed.

Effort Concentrated

From the military viewpoint, this action was well justified for other laboratories had been assigned to the problem since the preliminary success proved the practicability of the scheme. Thus, in June 1941, the National Defense Research Committee initiated an additional and intensive program in a contract with Columbia University, later known as the Airborne Instruments Laboratory. Here the NDRC effort on the airborne magnetometer was concentrated and service equipment was eventually produced. Coordinated studies were also located at General Electric Co., Sperry Gyroscope Co., and possibly at other places. Similarly, work was also under way at the Naval Ordnance Laboratory and, in cooperation with them, at the Bell Telephone Laboratories, and it is understood that a satisfactory instrument also resulted from their efforts.

With the completion, at Gulf's laboratory, of about 14 of the original Gulf-type magnetometer, sufficient to fill the gap to meet the immediate emergency, the Gulf laboratory work on the airborne magnetometer was suspended and, for the duration of the war, the research staff was assigned to other war projects in keeping with Gulf's determination to make the maximum possible contribution to the war effort. Thus, the further Gulf development of the airborne instrument for geophysical use was not again initiated until the close of the war was in sight and necessary personnel released for the purpose. In the interim, however, the Government found time for extensive experimental work and for complete magnetic surveys of prospective areas, with discovery of oil and other minerals the objective. This work has already proven the practicability of the airborne magnetometer as a geophysical exploration tool.

A prerequisite of any magnetometer is that the magnetometric element must have adequate sensitivity. This is easily attained in the Vacquier type "flux-gate" unit or the several possible derivatives thereof. However, in an airborne instrument, the useful sensitivity depends directly on the accuracy of the orientation stabilization of the magnetically sensitive element; that is, the measuring element must be maintained constantly in a fixed directional relationship with respect to the magnetic field vector, regardless of the motions and accelerations of the aircraft. Such stabilization and hence adequate operational sensitivity are realized by the Gulf instrument.

An aircraft comprises many parts composed of ferro magnetic materials as well as an extensive structure which is electrically conducting. In close proximity to a large ferro-magnetic parts, stray magnetic fields are to be expected due to permanent polarization or transient induced polarization, depending on its attitude in the earth's magnetic field.

Moreover, the aluminum frame and skin of the airfoils comprise excellent conductors in which eddy currents are generated while their attitude in the earth's magnetic field is changing due to maneuvers or inadvertent roll or pitch of the aircraft. The presence of stray magnetic fields due to these causes requires careful consideration in placing the measuring element of the magnetometer. To minimize these disturbances, the sensitive element may be placed in a suitably faired structure located at the wing tips or protruding from the tail Residual disturbances may be practically eliminated by suitable compensation means.

However, precise compensation may be difficult to achieve and alternatively the magnetometer element may be mounted in a small bomb-shaped structure or "bird" which may be towed at the end of a cable at a sufficient distance from the aircraft effectively to eliminate magnetic disturbances originating in the ship. Each position has its advantages and its handicaps and, in general, the

choice will be made after careful study of the airplane which is to be used.

For small or medium-sized planes, the alternatives would be wing mounting or towing the bird; probably the bird would be the choice in most such cases. For large planes, particularly those with no tail wheel, mounting in a structure protruding from the tail is practical, as well as the towing of the bird.

The Gulf airborne magnetometer provides a continuous record of geophysical data along the path flown by the carrying aircraft. In this respect it is unique among geophysical instruments, and it is likely to remain so. The record is of better than 1-gamma accuracy, which is superior to the performance of any known instrument heretofore used for portable use on the ground. The problem of determining the ground trace of the magnetic profile is more difficult perhaps than the magnetometric part of the job. The solution of this problem will vary with circumstances and may involve individually or in combination photographic, radar types, as well as other techniques.

For overland flying where the features of the terrain are varied enough to be recognizable, radar will probably not be required, as photographic methods, or even notations on the record by an obesrver may be sufficient to tie the record to ground positions. For over-water flying, or over dense jungle, or over any type of terrain where photography would not identify the ground position, radar may be necessary to tie the profile to fixed ground points.

The airborne magnetometer provides the only practical means for making magnetic prospecting surveys over water-covered areas. It takes much of the effort out of such work over jungle, marsh, and other areas difficult for ground transport. Within limits, it permits making surveys at any height above ground, and the effects of erratics such as volcanics, magnetic gravels, and the like, are easily eliminated. Thus, useful magnetic surveys can be made by means of the airborne magnetometer over land areas where surface magnetic conditions so influence a ground survey as practically to vitiate its usefulness. It is, of course, the fastest means known for securing geophysical prospecting data of any kind, and it will be, ultimately, area for area, the cheapest of all means for geophysical prospecting.

The investment required for airborne magnetic surveying is very substantial. It can be justified only by an operator whose need for the equipment is sufficiently extensive to make it pay out. For this reason, it appears probable that the number of operators to do such work will remain relatively small, and companies requiring such service on a small scale will undoubtedly be served most economically by a contractor who obtains the volume required for economic operation by serving a large number of clients.

Those geophysicists who prefer to do their geophysical work in the relative comfort of the home office will be pleased to learn that airborne magnetic surveys will require small field crews and large computing staffs. The field data will be obtained very quickly. An airplane doing 125 m.p.h. and flying magnetic profiles 4 hours per day will provide 500 miles of continuous profile per day. It will require the computing staff many days to reduce these data to a magnetic map.

When you have completed your field work and the consequent office reductions, you have a magnetic map. The distribution of the data over the area may be more ideal, the effect of surface disturbances may be conspicuously absent, and the map may differ from one derived from ground observations in other ways. Basically, the problems of converting the magnetic picture into its geologic counterpart remain the same. The airborne magnetometer presents primarily an improvement in instrumentation and, provides means to cover certain areas inaccessible to the standard ground-type instrument, it provides a method making possible a clear picture in areas heretofore plagued by surface disturbances and surveying at more than one datum plane. Its value as an exploration tool will still depend upon judicious use in selected areas where the magnetometric method holds promise of contributing useful information.

The airborne magnetometer permits the making of better magnetic maps faster and ultimately cheaper. The advantage of airborne over surface surveys is definite in land areas where surface transport is easy; it is great where surface transport is difficult.

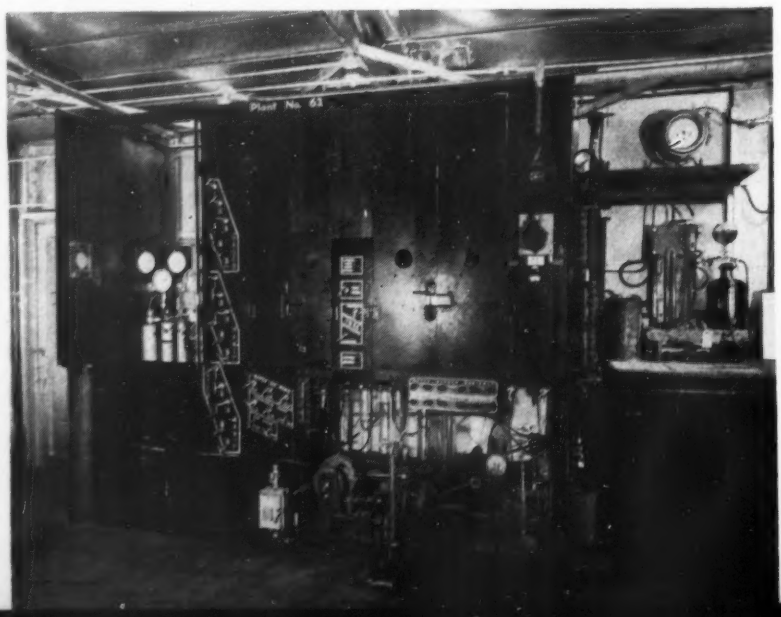
This development has been the subject of a great deal of rumor, and there appears to be an insistent and widespread demand for this new type of geophysical service. Wartime circumstances have prevented the immediate fulfillment of this demand, and our nation-wide reconversion troubles have not been helpful in making the preparations necessary to meet it. The over-all picture is receiving aggressive attention, however, and it is expected that the airborne magnetometer will be as available generally and reasonably soon as are the seismograph and the gravimeter.

New Laboratory Plant Has Unusual Features

THIS high-pressure continuous-type laboratory plant was designed by Universal Oil Products engineers to carry on thermal and catalytic reactions up to 12,000 psi. and 1,050° F. The iron doors of the stall at the left are open. All control valves extend through the barricade, and instrument readings are made through nonshatterable windows.

Gas to be processed is charged into the high-pressure gas bottles to the desired operating pressure by a compressor, and discharged into the preheater section of the reaction tube by water displacement by means of hydraulic pump. From the volume of water pumped from a graduated cylinder the amount of gas charged as well as the rate may be determined.

Liquid to be processed is pumped from the high-pressure calibrated liquid charger into the top of the preheater section of the reaction tube. The liquid charger is constructed to withstand the required high pressures so that materials of relatively high vapor pressure may be pumped in the liquid phase. Heat is supplied by an electric furnace.



QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Simplified Flow Diagrams

Thermal Black Processes

Have you any information on the production of carbon black by decomposing gas or oil? We will appreciate any references to such a process.—F.M.C.

In reality all of the processes of carbon-black and lampblack manufacture involve decomposition of gas or oil. In the common channel and furnace processes the decomposition occurs simultaneously with a partial combustion of the material. The question probably refers to the variously named thermal decomposition, cycle furnace, or thermal processes. Although such processes are recognized they have not been widely used because of the less-useful qualities of the blacks produced by them, because of the difficulties inherent in a process in which equipment must be almost gas tight, and because of the expense of applying the heat necessary for the decomposition reaction. Thermal black does not find as wide a usefulness as other blacks, notably in rubber compounding. Its general characteristics are:

	Fine (F.T.)	Medium (M.T.)
Avg. particle dia., mμ	150-200	250-500
Surface area, sq. m. per gm.	20-15	10-5
pH of a sludge of black in water	7	7
State of aggregation in rubber	low	low
Tinting strength	medium	medium

The most successful method of applying heat appears to be a cycle operation which involves burning gas to heat checkerbrick and then using the checkerbrick to heat additional gas, as indicated on the flow diagram on this page. There are, however, many different furnace arrangements. In the process shown here (thermal decomposition furnace process), the partially decomposed gases from one unit can be burned in a second furnace to heat its checker work or it may be cycled along with the new gas. Recycling assists in producing a smaller-diameter carbon black. During the "heat" period the refractory checkerwork is heated to 2,000°-3,000° F. and during the "make" period the gas is passed through the hot checkerwork until the temperature drops to about 1,400° F. Yields up to 16 lb. per thousand cubic feet of gas have been attained. Thermal blacks are usually not pelleted.

The black is removed from the decomposed gas by being cooled with water-wash sprays, collected by a bag filter system, and conveyed to storage; or it may be passed through a water-wash box filtered from the water, dried, pulverized, and screened.

More detail can be obtained concerning the many modifications of the thermal processes from the following references:

1. Staley, F. R.—Carbon Black Industry Strains to Meet Requirements for Rubber, The Oil and Gas Journal, page 86, March 9, 1946.

2. Loving, W. L. — Carbon Black, Petroleum Engineer, page 176, November 1945.

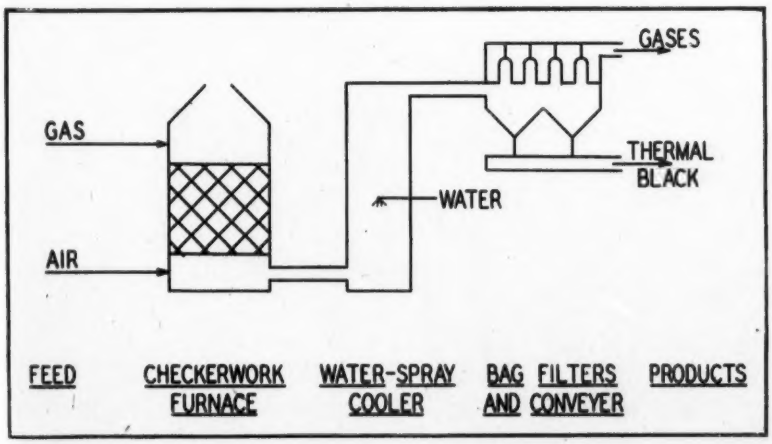
3. Cohan, L. H.—Carbon Black in War and Peace, Chemical & Engineering News, page 2078, November 25, 1945.

4. Gallie, J. F. — Carbon Black, Parts 1 & 2, Petroleum Refiner, page 97, March 1944, and page 115, April 1944.

5. Nelson, W. L.—Furnace Black for Synthetic Rubber, The Oil and Gas Journal, page 62, 1943.

6. Mattiello—Protective and Decorative Coatings, Vol. 2, John Wiley & Sons, 1942.

7. Ellis, C. — Chemistry of Petroleum Derivatives, Vol. 2, Chap. 8, Reinhold Publishing Co., N. Y., 1937.



Simplified flow diagram of thermal black process

References on Evaporation Losses

We have encountered a problem concerning the evaporation losses in a storage tank for a somewhat volatile chemical. We seem to recall that you published something about this situation and we hope that you can list any of your publications that might be pertinent.—J. P. T.

Information on "Evaporation Losses at High Altitudes" was published on the Questions on Technology page of December 9, 1944, page 83. This discussion shows that tank-filling losses for gasoline are about fivefold at 15,000-ft. elevation as compared with losses at sea level.

The mechanism of evaporation from storage tanks was discussed under the title "Practical Significance of Vapor Pressure" on the January 6, 1945, issue of Questions on Technology (page 76).

Finally, several issues of The Refiner's Notebook pertain to various phases of volatile liquid storage:

No. 2A, page 87, January 20, 1945—Crude Evaporation Losses (amount of loss and cost of storage in various types of tanks).

No. 5, page 110, August 19, 1944—Eliminating Vapor Space in Storage Tanks (types of tanks and roof constructions).

No. 6, page 125, August 26, 1944—Gas Holder Systems (as applied to oil storage).

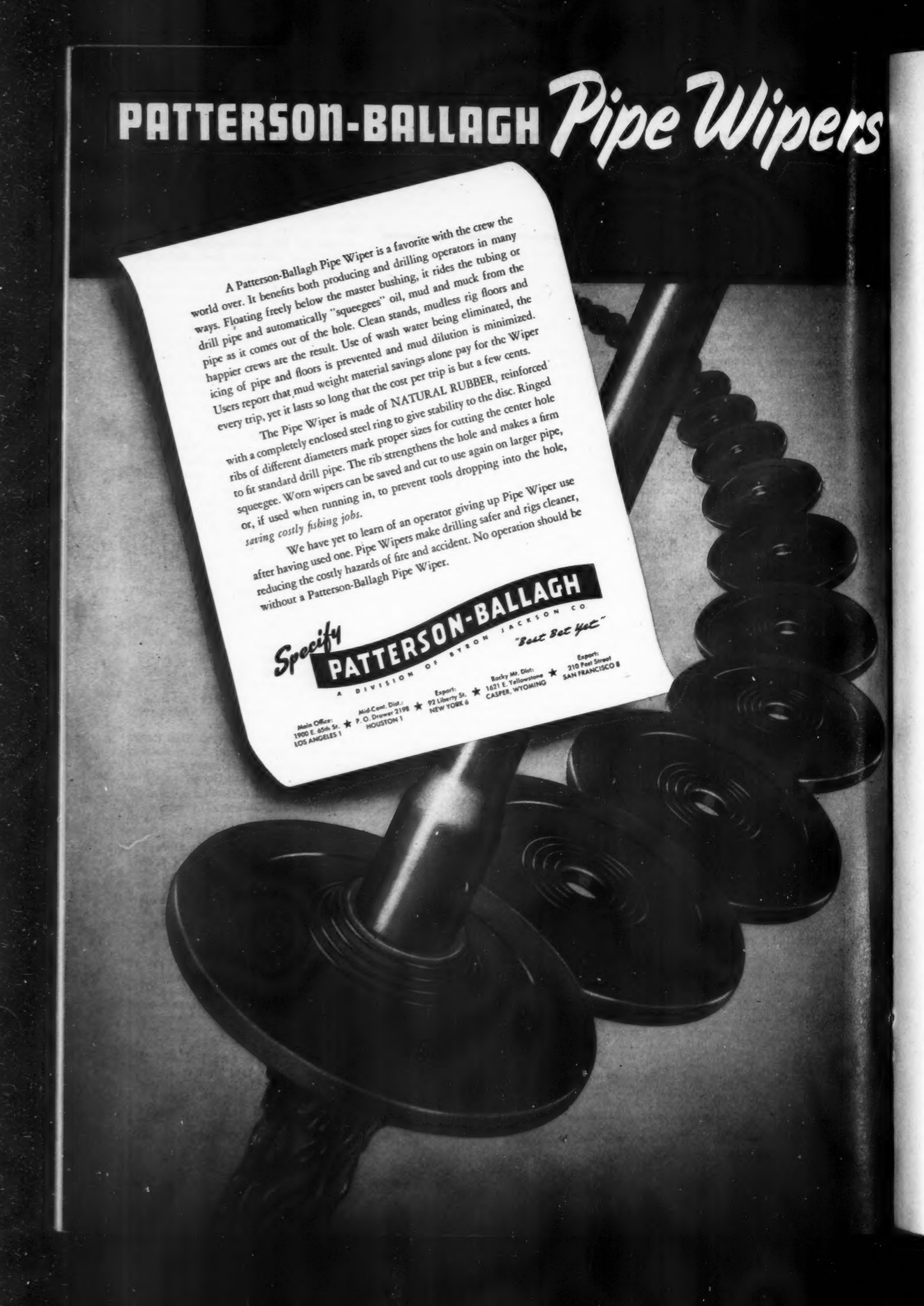
No. 7, page 61, September 2, 1944—Volatile Liquids Storage (types of tanks for various pressures).

No. 14, page 137, October 21, 1944—Tank Foundations and Auxiliaries (shows vapor seal for swing line).

No. 18, page 247, November 18, 1944 — Vent Lines — Vapor Handling (sizes of vent lines and vent valves required).

The last topic is so complicated and is so vitally important that attention is directed to Louis Bosa, "The Calculation of Venting Requirements for Low-Pressure Oil Storage Tanks," The Oil and Gas Journal, page 196, November 18, 1938.

PATTERSON-BALLAGH *Pipe Wipers*



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Small Fluid Cat Cracker Designed to Compete With Units of Larger Capacity

This article describes a development in the design of catalytic-cracking operations for use in refineries of small capacity. This description was taken from information published in Kelloggram, of The M. W. Kellogg Co., designers of the process.

THE inevitable trend toward higher quality motor fuels has been accelerated by the widespread adoption of catalytic-cracking processes immediately before and during World War 2. This trend is in line with the oil industry's own purpose of conserving crude by producing more and better gasoline from each barrel processed. As had generally been the case the problem of adaptation of catalytic-cracking principles to small-scale operations has been a serious one, all the more important because more than 70 per cent of the refineries in this country have a daily crude capacity of less than 10,000 bbl. per day.

All indications are definite that octane ratings of 80 for housebrand gasoline and 85 for premium grades will obtain probably in the immediate postwar era. Refiners cannot supply fuels of these octane ratings by thermal-cracking processes alone. Although realizing that it is imperative that they modernize their processes in order to compete and stay in the refining business, the smaller refiners are slow to adopt expensive processes. They feel that catalytic cracking has not been adapted to small units satisfactorily and the variety of proposals for small unit design which have been published have served to increase their indecision.

The M. W. Kellogg Co., which has built more than 70 per cent of the existing Fluid catalytic-cracking, has made an intensive study of both the economic and engineering problems of the small catalytic-cracking unit. This study has determined that (1) in the majority of cases Fluid catalytic cracking can be utilized by the small refiner to meet quality standards of competition and still show a profit, and (2) in the small unit the "earning power" factor becomes more and more important since the throughput of the smaller units is less. So it becomes necessary to build into the small units the process fundamentals which have made practicable the high earning records of the larger units. Thus, the design and operating characteristics of the small unit must follow closely those which have proved efficient in large units.

As will be shown in the two refinery studies presented here, the cost of crude and the price structure for refined products are much more important in the determination of the profitability of refinery operations which include catalytic cracking than are initial costs or operating expenses. A small refinery located some distance away from a highly competitive marketing territory often can return a greater profit per barrel of crude processed than can a large refinery placed within such a highly competitive territory. A difference of only 200 or 300 miles may show such a favorable cost differential, by reason of a higher price structure for all refined products sold by the smaller refiner under less competitive conditions. The small refinery placed in the same area with larger plants may present a more difficult problem, yet the same considerations which have enabled such a small plant to compete successfully with larger refineries in the past, it is believed, will make it possible for it to so compete in the future.

Since current refinery operations can keep economic pace with the demand for high-quality gasolines only by using catalytic cracking, the question becomes not so much that of whether or not a small "cat" cracker

TABLE 1—ECONOMICS OF MODERNIZED REFINERY PROCESSING
4,500 Bbl. per Calendar Day of 38° A.P.I. Mixed-Base Crude

	Unit price, cents/gal.	Barrels per calendar day	Per cent	Dollars per calendar day
Credits:				
Motor gasoline (80 CFR-M)	6.75	3,105	69	8,803
Straightrun distillates	5.25	540	12	1,191
Heavy fuel oil	2.75	495	11	572
Gas (fuel-oil equivalent)	2.75	405	9	468
Total credits		4,545	101	11,034
Debits:				
Crude oil	1.50 bbl.	4,500	100	6,750
Direct operating costs:				
(a) Topping, thermal operations, etc.				555
(b) Fluid cat.-cracker and gas recovery				935
(c) Catalytic polymerization				140
(d) Leading (0.7 cc. TEL per gal.)				170
(e) Miscellaneous plant expense incl. royalties				420
(f) Taxes and insurance, etc.				160
Total debits				9,130
Net refining operating credit per year before depreciation and taxes				$694,960
Motor gasoline manufacturing cost before depreciation charges, cents per gal.				5.29

TABLE 2—ECONOMICS OF MODERNIZED REFINERY PROCESSING
9,500 Bbl. per Calendar Day of 36° A.P.I. Paraffinic Crude

	Unit price, cents/gal.	Barrels per calendar day	Per cent	Dollars per calendar day
Credits:				
Premium gasoline (85 CFR-M)	7.5	1,045	11	3,292
Housebrand gasoline (80 CFR-M)	6.5	5,985	63	16,339
Total gasoline		7,030	74	19,631
Heavy fuel oil	2.4	1,805	19	1,819
Gas (fuel-oil equivalent)	2.4	855	9	862
Total credits		9,690	102	22,312
Debits:				
Crude oil	1.55 bbl.	9,500	...	14,725
Direct operating costs:				
(a) Topping, thermal operations, etc.				1,150
(b) Fluid cat.-cracker and gas recovery				1,100
(c) Catalytic polymerization				240
(d) Leading (1.6 cc./gal. in housebrand)				875
(e) Miscellaneous plant expense incl. royalties				780
(f) Taxes and insurance, etc.				250
Total debits				19,120
Net refining operating credit per year before depreciation and taxes				$1,165,000
Total gasoline manufacturing cost before depreciation charges, cents per gal.				5.57

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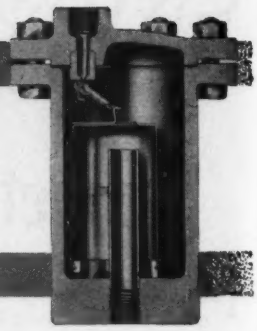
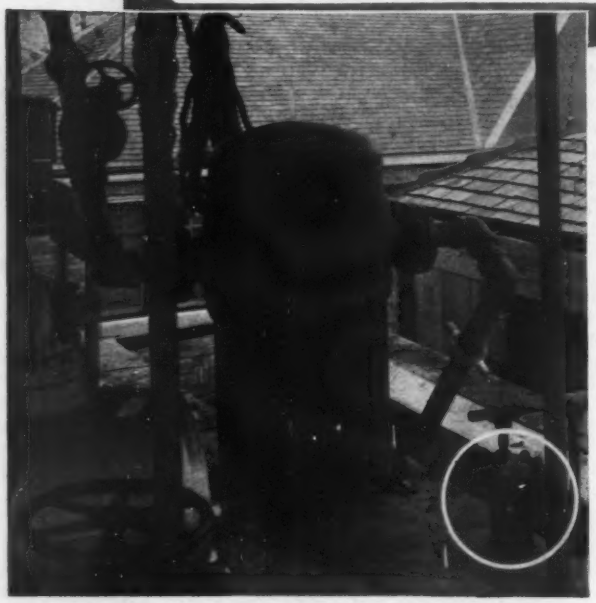


Armstrong Forged Steel Trap on rotary drilling rig.



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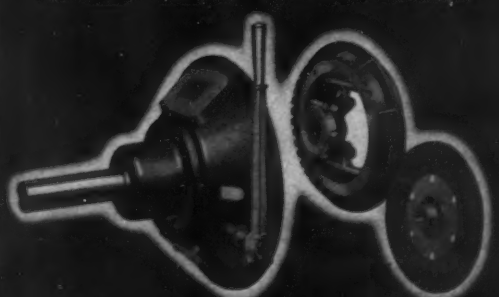

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is desirable, but more as to how it can be included in the refinery's operations most profitably. The particular situation in each refinery requires a detailed study and intensive analysis to determine the specific answer in each case.

Studies have been prepared on the possible operation of two refineries, of 4,500 bbl. and 9,500 bbl. of crude per day, respectively. The modernization program is assumed to provide the same processing sequence which includes topping, conditioning reduced crude, Fluid catalytic cracking, catalytic polymerization, thermal cracking of catalytic cycle stock, and thermal reforming of heavy naphtha. Detailed values in these studies are shown in Tables 1 and 2.

The cost of depreciation has been ignored in these studies because the wide variation in existing equipment at different refineries makes it impossible to arrive at any general assumption regarding these costs. With small throughputs the depreciation cost per barrel is affected importantly by the amount of new equipment necessary to add to the plant, so the amount and kind of existing equipment in a given refinery is a controlling factor in modernization.

It is noted that 5.3-cent gasoline is possible from a 4,500-bbl. per day refinery, with 1,700 bbl. per day of catalytic-cracking capacity. Such a plant can show $700,000 net operating credit per year before depreciation and taxes. A plant of 9,500 bbl. per day crude capacity can show a similar credit of $1,200,000 per year.

Supporting the statement made on the effect of a strategic location on refinery economics we note that the refinery processing 4,500 bbl. per day can make a larger profit per barrel than can the plant processing 9,500 bbl. per day. This result is due to the fact that the smaller plant is located in an area showing a more diversified demand for the more profitable products and having a higher price structure, and in spite of the higher cost of each operation in the smaller plant, except lead blending. These prices and yields are based on present market conditions and on projected refinery operations. From these and other studies completed it may be stated safely that in the majority of cases the initial cost of installation will still enable the small refiner to operate at a worth-while profit even after depreciation and amortization charges are deducted.

No Essential Design Difference

Recently the idea has been created that the small catalytic unit must be radically different in design from those of large capacity. Yet this small unit is expected to and must show the inherent processing efficiencies and the flexibility that gives the larger units their earning power. Because of the identity of purpose no essential difference in basic design between small and large units can be made, merely on the basis of capacity difference. This does not mean that the small unit must be a miniature of the large units built during the war. Built at a time when production of aviation gasoline quickly and continuously was of paramount importance, they were designed when no commercial operating data were available and many items were purposely overdesigned to insure a margin above the calculated capacity. This proved to be good policy, since even the first units operated satisfactorily immediately they went on stream, in many cases showing higher outputs.

Six years of experience in operating these units has of necessity taught many mechanical and processing improvements and this has come about mainly by the elimination of overdesign features included originally in wartime units. The largest units of today are simpler than were the early units, without sacrificing any fundamental principles of Fluid operations. Due mainly to decreased size, further mechanical simplification is practicable in the small modern unit. These require less framework, lower elevation, piping is simplified, and

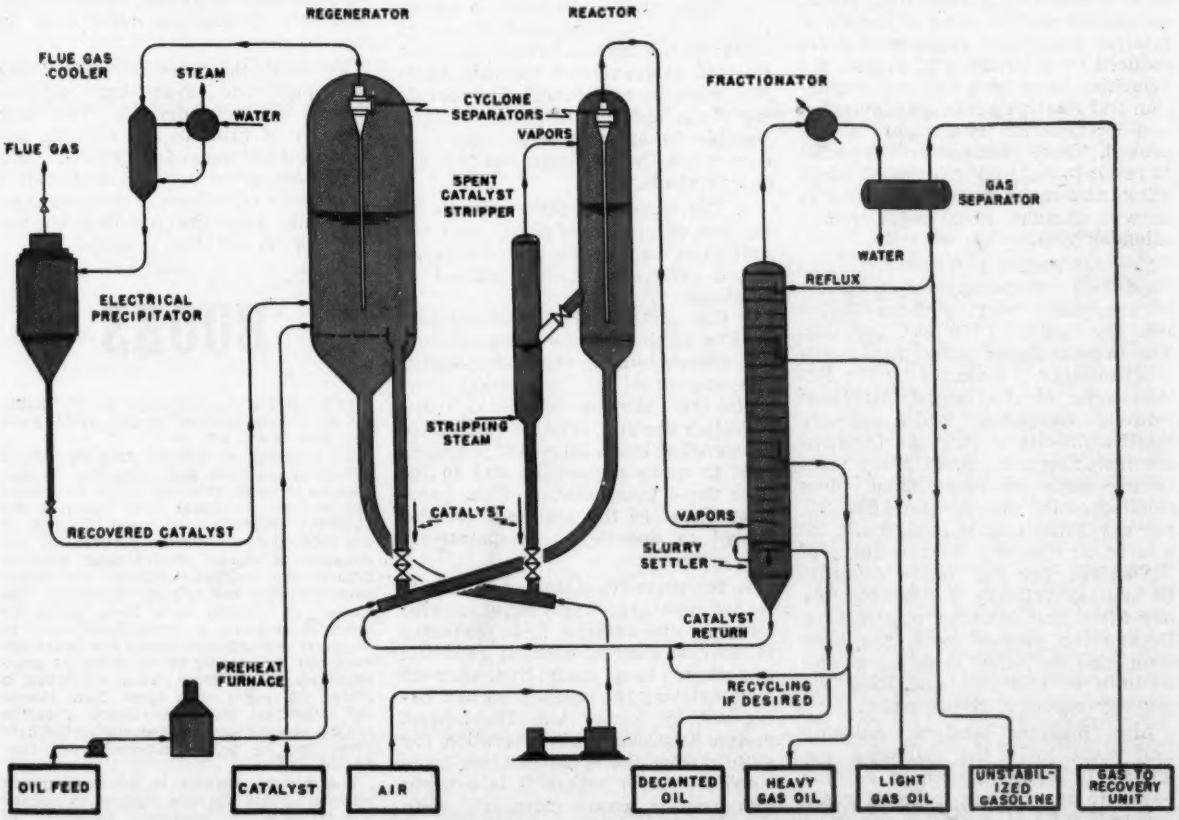

Fig. 1—Flow chart of small-capacity Fluid catalytic cracking unit described here

elevators no longer are necessary for proper operation.

Improvements Based on 250 Million Barrels of Operating Experience

The accompanying diagram (Fig. 1), incorporates experience gained in Kellogg units throughout this 6-year period. These results come from the processing of a quarter of a billion barrels of feed stocks, ranging from light distillate fractions to reduced crude of low and high sulfur contents, the products ranging from aviation gasoline and butylene to motor fuels.

This diagram is a typical flow chart for 4,000-bbl. per day Fluid catalytic-cracking unit now under construction for a 10,000-bbl.-per-day refinery. The main structure is very compact, occupying only 1,650 sq. ft. area, or half of an average city lot. The design features the support of reactor, regenerator, and precipitator at the same elevation which is only 69 ft. above ground level. This radical improvement necessitated a complete redesign of the unit to harmonize all variables of pressure, temperature, velocity, etc., into such a balanced whole as to require a minimum use of utilities. For example, all vessels except the regenerator can be fabricated in the shop. Specially improved designs eliminate the need for internally lined piping, reducing erosion to a minimum, by improved piping design and special sizing of the major catalyst lines. Heat requirements are reduced by a rerouting of piping; gas velocities have been reduced, expansion and rotation joints are eliminated and precipitator equipment is improved. These changes are expected to result in reduced investment, operating, and maintenance costs and to show continuous runs longer than a calendar year.

The fundamental design principles illustrated can be applied efficiently to capacities varying from 30,000 bbl. per day to 1,700 bbl. per day. The importance of sound fundamentals in design is indicated by the fact that some of the largest American refining companies which operate small refineries in strategic locations are including such small Fluid units in the plans for modernizing these small capacity plants. One 4,000 bbl. per day Fluid unit is being built for a large oil company for a refinery of 10,000 bbl. per day crude capacity. In another refinery a 5,000-bbl.-per day Fluid unit is under construction. In addition, design work has been completed for other large companies on units of 1,700 bbl. and 2,250 bbl. per day capacity, respectively.

Any modern catalytic cracking unit must meet the following demands, to be of maximum earning power to any refiner, large or small:

1. The unit must embody the Fluid principle of powdered catalyst circulation, since this turbulence provides intimate catalyst and vapor contact; constant temperature and pressure in the reaction zone insure improved yields and product uniformity; continuous, uniform regeneration is supplied with minimum catalyst degradation; catalyst can be circulated freely without regard to mechanical transfer equipment limitations; to vaporize the charge completely is unnecessary, in fact most operations include the injection of liquid oil; circulation of catalyst enables the unit to transfer heat from regenerator to reactor without danger of thermal cracking and coking as is the case in fired heaters.

2. Units must be capable of handling heavier charge stocks since experience shows that the heavier the charge the greater the advantage of catalytic over thermal cracking.

3. Units must have built-in flexibility to meet changing market demands; the most economical conversion rate for a once-through operation at present is between 45 and 55 per cent; higher rates make more coke and gas without improving the gasoline yield substantially; higher gasoline quality is needed or if charge stock is reduced in quantity then recycling may be employed to maintain gasoline output by attaining a higher conversion level on the total fresh feed.

4. Units must have built-in versatility to handle any kind of charge stock; thus a proper balance between internal and external thermal facilities must be maintained. By providing for a feed preheat furnace it is possible to operate at the optimum conversion level regardless of the charge stock.

5. The basis of design must be on the use of proved catalysts, and the unit must be capable of utilizing all tested catalysts whether natural or synthetic.

6. Operating at high pressures permits reduction in the sizes of lines and vessels but the continuing higher consumption of utilities quickly eliminates the savings in initial costs; therefore the unit must be economical in operating costs. Increased pressures tend to make more coke and to reduce the octane number of the gasoline; therefore the unit must be designed to operate at comparatively low pressures.

7. To prevent entrained and adsorbed products from being carried away by the catalyst it is necessary to provide a spent-catalyst stripping system to keep such hydrocarbons from entering the regenerator and being lost by combustion. The newest design improves this operation by withdrawing the spent catalyst to an outside stripper where it is brought into contact countercurrently with the stripping medium.

8. Loss of catalyst in the flue gases must be avoided and the latest design includes the use of a single-stage cyclone in the reactor and regenerator, while flue gases are treated with an electrical precipitator of improved design.

9. Catalyst must be recovered completely from the product streams. To this end a scrubbing system is placed in the bottom of the fractionator to recover entrained catalyst which prevents contamination of equipment and products. A slurry settler enables the operator to draw off most of the heavy oil and return catalyst to the reactor. So located it requires no separate equipment, has the additional advantage of increasing the catalyst settling rate since the full tower temperature reduces the viscosity of the heavy oil.

10. Control of the entire process by automatic instruments eliminates the human element to the highest practicable degree, to insure uniformity of product quality, long on-stream periods and maximum equipment life, yield and quality of product and minimum operating costs.

11. Long continuous runs must be practicable to maintain maximum earning power. Down time means daily loss of thousands of dollars, repair costs, and loss of product output. Units must be simple and rugged. The present 90 per cent stream efficiencies, with runs of more than a calendar year, are expected to be considerably greater in units built in future.

To meet these major engineering principles, the equipment requirements are very definite. The true measure of value in any refining operation is ultimate earning power, and each item going into the design of a Fluid unit must have a definite purpose and must be justified on the basis of its earning power.

BOOKS

THE CHEMICAL PROCESS INDUSTRIES. By R. Norris Shreve. McGraw-Hill Book Co., New York. 987 pp.

An assembly of detailed data on various industrial chemical processes, this volume appears to be an excellent effort to present the essential technical facts covering the different operations discussed. Typical of the three dozen processes covered are the chapters on water conditioning; plastics; natural and synthetic rubber; the petroleum industry and organic chemicals. Obviously in treating such large fields the information given is confined normally to chemical reactions involved, raw materials used and the routine of the different process steps. For example, while alkylation is given two pages with three flow charts, the individual processes receive attention in only one paragraph. Necessarily the data given can be only brief and very condensed.

The volume appears to be an excellent reference work for the student in college who requires a condensed discussion of many processes, a library volume which gives the essentials of each process.

Engineering Fundamentals

No. 238

A FEATURE OF THE OIL AND GAS JOURNAL

Angles and Directions in Surveying Work

ONE of the most important jobs of the surveyor is to determine the directions of lines and to find the angles formed by their intersection. Generally such lines are those of a traverse. Traverses are of two kinds. (1) They may be in the form of an open traverse where they begin at a point and continue forward as a series of various lengths and of different directions stopping abruptly at some forward point (Fig. 1), or (2) they may be in the form of a closed traverse where the survey starts at a point, and measures distances and directions but continues around an area until it finally closes upon the point of beginning (Fig. 1).

Two methods are commonly used to determine the directions of lines. These are by bearings and by azimuths. The three common methods utilized to measure the angles formed by the intersecting lines of a traverse are by deflection angles, by interior angles, and by angles to the right. The latter method is sometimes referred to as "azimuths from the back line." These different methods will be discussed in detail.

Nearly all transits are equipped with a compass needle. When this needle is let down on its pivot point it will orient itself parallel to the earth's magnetic field. The direction that the needle assumes is said to be in a north and south line. Actually it is magnetic north and south. If the direction of the magnetic needle at a given point were projected down upon the surface of the earth it would give what is known as the magnetic meridian. The magnetic bearing of a line is found by measuring the acute angle which is formed by passing the magnetic meridian through one or the other of the extremities of the line. Thus magnetic bearings express the angular deviation of a line from either the north or south toward either the east or west. Hence the magnetic bearing of a line cannot be greater than 90°, at which time the line bears due east or due west.

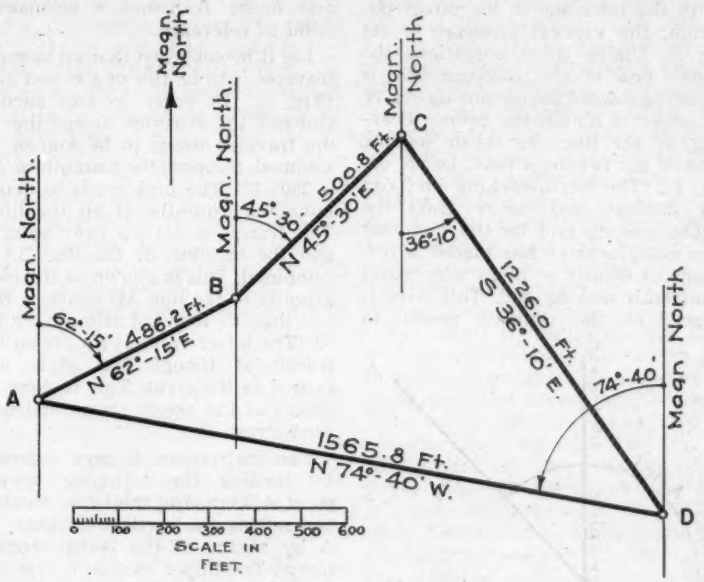

Fig. 2—Magnetic bearings of lines

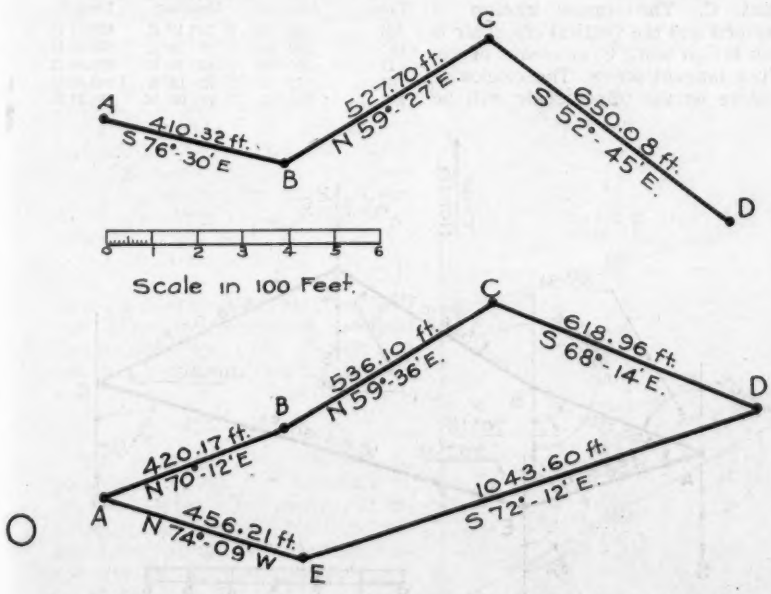

Fig. 1—(Upper) An open traverse from point "A" to "D"; (lower) Typical closed traverse. It starts at a given point such as "A," and finally "closes" back on "A"

Fig. 2 illustrates the magnetic bearings of a four-sided closed traverse. The bearings as indicated are those for the lines if the surveyor moves clockwise around the area. Should the surveyor move counter clockwise around the area as from A to D, etc., the bearings of the lines would be opposite in direction and (theoretically) of the same

Series prepared by Dr. E. A. Stephenson, head of petroleum engineering school, and Prof. D. Don Haines, department of civil engineering, University of Kansas

magnitude; thus the bearing of AD (Fig. 2) would be S 74° 40′ E. Actually the magnitude may vary slightly due to local attraction at either one or both of the two ends of the line.

In order to observe the magnetic bearing of a line the transit is first set up over one or the other of the extremities of the line. Suppose it is set up over point A in Fig. 2. The compass needle then is let down carefully onto its pivot point, and, with the telescope in the direct position, the vertical crosshair is set on B. Under these conditions the north end of the compass box is pointing toward the distant object, B; in order to obtain the proper bearing of the line the north seeking end of the needle is read, i.e., N 62° 15′ E. (The north-seeking end can be distinguished easily from the south-seeking end by the fact that the manufacturer has placed a few turns of copper or brass wire about the south-seeking end. This wire is placed on the compass needle to

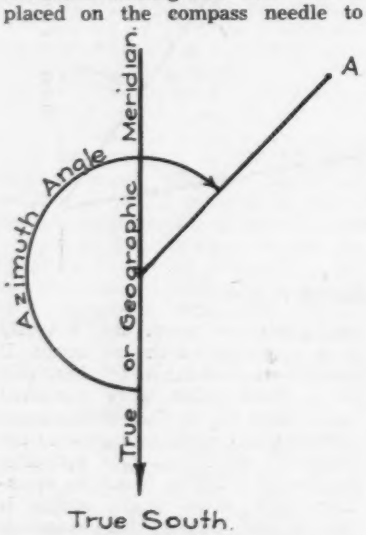

Fig. 3—Azimuth measured from true south

counteract the effect of the vertical component of the earth's magnetic field. In this hemisphere it tends to pull the north-seeking end of the needle downward). Similar observations are then taken at points B, C, and D.

The directions of lines should not be taken by a magnetic needle except on preliminary surveys and on very unimportant surveys. This is because the position of the magnetic meridian in the same locality varies appreciably from time to time.

Azimuths

An azimuth is the angular direction of a line measured in a clockwise direction. The angle may vary between the limits of 0° and 360°. The point of reference may be true, magnetic, or assumed south; or true, magnetic, or assumed north (Fig. 3). For surveys of any importance, or for surveys covering large areas, the directions of lines should be referred to the true meridian. A true, or geographical meridian, is the projection of a line joining the true north and south poles on the surface of the earth. Its direction remains constant and hence furnishes a permanent point of reference.

Let it be supposed that an azimuth traverse is to be run of a closed area (Fig. 4). In order to run such a traverse the direction of one line on the traverse needs to be known, or assumed. Suppose the azimuth of AB is 250° 12′. The problem is to determine the azimuths of all the lines. The transit is set up over point B and the azimuth of the line BA is computed. This is known as the back azimuth of the line AB which is 180° less than its forward azimuth, or 70° 12′. The latter value is set off on the transit as though the angle was turned to the right. This is done by means of the upper clamp and tangent screw.

The instrument is now oriented by turning the telescope toward point A, clamping the lower motion, and setting the vertical crosshair on A by means of the lower tangent screw. The upper motion is released and the telescope is then turned either to the right or left toward point C. The upper motion is clamped and the vertical crosshair is then set on point C by means of the upper tangent screw. The clockwise reading on the upper scale will be the forward azimuth of the line BC, 239° 36′.

The instrument is moved to C and the operation is repeated to find the azimuth of the line CD, 291° 46′. The azimuth of DE is determined in the same way, being recorded at 72° 12′. The back azimuth of the line DE is computed by adding 180° 00′ to its forward azimuth, 252° 12′. The computed back azimuth is then set off in a clockwise direction on the upper scale. The instrument is then oriented by taking a backsight to D from E. The forward azimuth of the line EA is then observed. After the azimuth of EA is determined, the azimuths of all lines on the traverse are known but point A should be occupied and the forward azimuth of the line AB observed. Theoretically the observed value should check exactly with the original value (252° 12′) as used in the beginning, but actually some difference is usually found between the two values. This is known as the angular error of closure. In general the angular error of closure may be equal to or less than the least count of the instrument times the square root of the number of chances of error. For a traverse such as that illustrated in Fig. 4 the allowable error could be 2½′ or 3′ for an instrument with a least count of 1′.

Sometimes it is necessary to change azimuths to bearings. The azimuths and bearings for the lines of Fig. 4 are tabulated below:

Line	Azimuth	Bearing	Length
AB	250° 12′	N. 70° 12′ E.	420.17 ft.
BC	239° 36′	N. 59° 36′ E.	536.10 ft.
CD	291° 46′	S. 68° 14′ E.	618.96 ft.
DE	72° 12′	S. 72° 12′ W.	1,043.60 ft.
EA	105° 51′	N. 74° 09′ W.	456.21 ft.

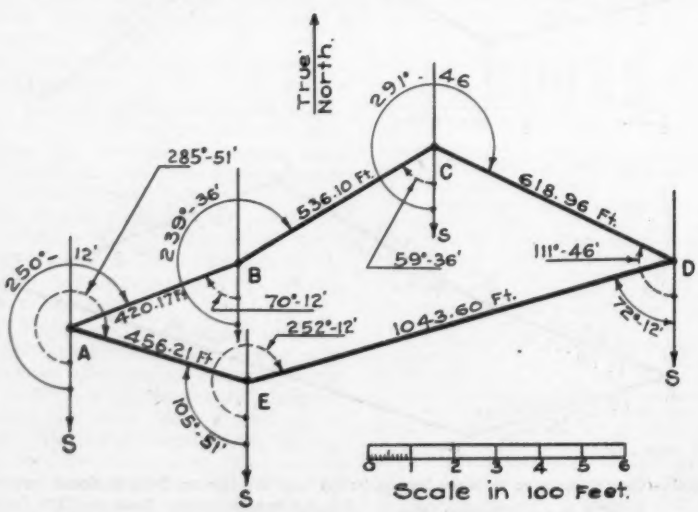

Fig. 4—Closed azimuth traverse

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Over-all Transfer Rates

HEAT transfer is so complicated that over-all rates must be computed for each particular situation by consideration of each of the two fluids (Refiner's Notebooks Nos. 91 and 92, May 4 and May 11, Inside and Outside Tubes), and the degree of fouling of the two surfaces (Notebooks 94 and 95, May 25 and June 1, Water, Crude Oil, Oil Products, etc.). Only when direct experimental results on the equipment are available, can over-all transfer rates be picked without consideration of these variables.

$$H = \frac{1}{\frac{1}{h_t} + R_t + \frac{1}{h_s} + R_s}$$

in which H is the over-all transfer rate in B.t.u. per sq. ft.-hr.-° F. of temperature difference, h_t and h_s are the respective film-transfer rates inside and outside (shell) the tubes, and R_t and R_s are the fouling resistances on the inside and the outside of the tubes.

Gasoline exchanger. — Wet crude oil is being heated from 70° to 230° F. by means of cracked gas and gasoline vapor (no steam) which is cooled and partially condensed between 350° F. and 280° F. as indicated in Fig. 1. The vapor passes through the shell and the crude oil flows at about 4 ft. per second through the tubes. The 36.5° A.P.I. crude oil has a viscosity of 48 Universal Saybolt seconds at 100° F. and it contains only minor amounts of sulfur (0.27 per cent).

The film-transfer rate for the gasoline (h_s) can be estimated from Table 2, Notebook 92, May 11, 1946, for gasoline condensing without steam. The low limit of 180 was selected because cracked gases are present.

$$h_s = 180$$

The crude-oil film rate can be selected from Fig. 1 of Notebook 91, May 4, 1946, by consideration of the velocity and viscosity (and film temperature). According to Notebook 92 the average film temperature will be about:

$$150 + (315 - 150)/8 = 171° \text{ F.}$$

in which 150 is the main body temperature of the crude oil and (315—150) is the arithmetic average temperature difference (see Fig. 1). According to Notebook 93 (near Curve 8, Fig. 1) the viscosity of this crude oil at 171° F. will be about 2.4 centipoises. The film-transfer rate for the crude oil at 2.4 centipoises and at 4 ft. per second by Notebook 91 is about 150.

$$h_t = 150$$

Fouling factors for this noncorrosive wet crude oil flowing at 4 ft. per second and at temperatures below 230° F., will be about 3.5 (see Fig. 1, Notebook 94, May 25) because the temperature is somewhat low.

$$R_t = 3.5$$

Overhead vapor products from fractionating towers have low factors (Fig. 1, Notebook 95, June 1), —in this case about 1.5.

$$R_s = 1.5$$

$$H = \frac{1}{\frac{1}{180} + \frac{1.5}{1000} + \frac{1}{150} + \frac{3.5}{1000}} = \frac{1}{.0055 + .0015 + .0067 + .0035}$$

$$= \frac{1}{.0172} = 58$$

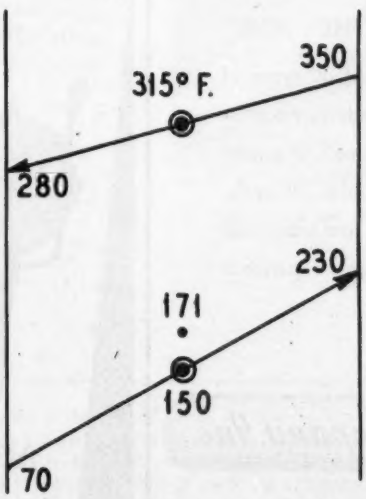

Fig. 1

Slightly more accuracy could be attained by computing the film temperature (the value is about 183° F. rather than 171° F. which gives an H of 59) but such reliance on the data is not justified.

Gasoline condenser.—What if the same gasoline were being condensed by water in a coil-in-box equipment? The condensing film rate (180) would be almost the same but the fouling factor might be a little larger (perhaps 2) due to the low velocities in some regions and the naturally greater accumulation of dirt in such equipment.

The water is heated to only 120° F. and it contains 160 p.p.m. of temporary-hardness and 40 p.p.m. of permanent-hardness constitutents. This would be hard water and it contains much material that will be precipitated by heat. The exact velocity of circulation is unknown but it would be fairly high due to the high temperature of the gasoline (350-280° F.) compared to the water. For purposes of illustration a velocity of 1 ft. per second will be selected.

According to Table 3 of Notebook 92, May 11, 1946, the water film rate is about 220. Fouling will be severe because of the large temporary and permanent hardness particularly because such equipments are not cleaned regularly and in time a very thick scale will be produced. The fouling factor would be almost as large as anything shown on Fig. 2 of Notebook 94, and in a few months might be worse than anything shown. In addition the gasoline is at a high temperature and hence the factor should be multiplied by 1.35.

$$R_s = 10 \times 1.35 = 13.5 = 21.5 \text{ (in time)}$$

$$H = \frac{1}{\frac{1}{180} + .002 + \frac{1}{220} + .0135} = \frac{1}{.0055 + .002 + .0045 + .0135}$$

$$= \frac{1}{.0255} = 39.2$$

In time the rate will probably drop to less than 30.

No. 96 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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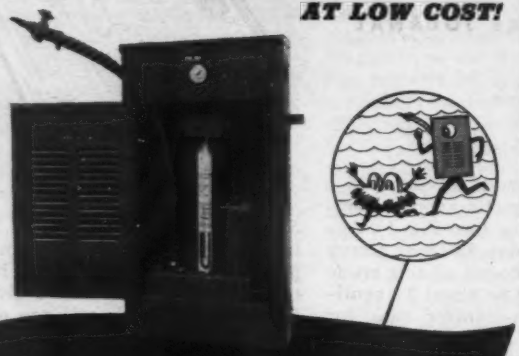

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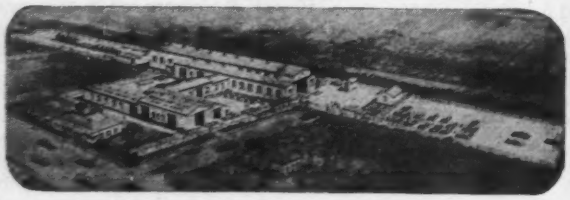

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OIL AND GAS EQUIPMENT Digest

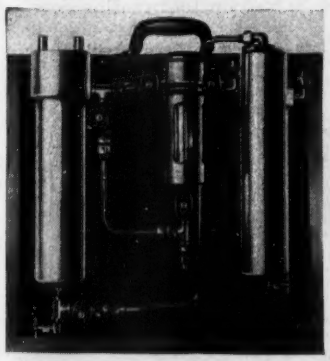
IT'S NEW CHECK IT

by Kenneth B. Barnes

(1) NEW ALUMINUM-TYPE PUMPS are a distinct pioneering development for truck-mounted rotary rigs, seismic shot-hole drills, and other services where the utmost in lightness and portability is desired, and where by the use of aluminum pumps great reductions in weight can be achieved. All-aluminum reciprocating pumps to be manufactured in full line of sizes and capacities, following conventional Wheatley designs, for all fluid-displacement purposes. *Frank Wheatley Pump and Valve Manufacturer.*

IT'S NEW CHECK IT

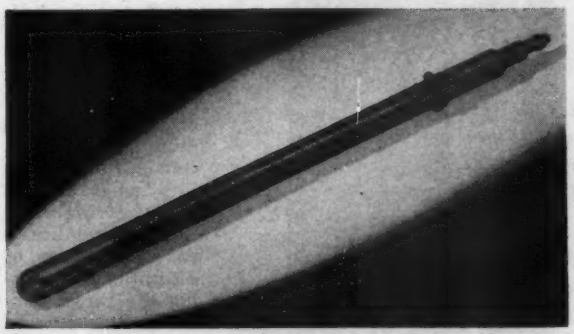
(2) DEHYDRATOR UNIT has a moisture pick-up capacity of 50 grams of water while maintaining a dewpoint of 90° F. below zero. The unit is applicable to many commercial dehydrating problems as it is capable of dehydrating compressed-air lines with pressure up to 2,000 psi. Eliminates cumbersome installations in most instances and the dehydrating chemicals are inexpensive to replace. Can be equipped with a dewpoint color-change indicator which insures accuracy of working conditions. *The Russell R. Gannon Co.*



IT'S NEW CHECK IT

(3) NEW ELECTRIC INTERVAL TIMER to control the running time of process equipment, duration of exposure, to close one circuit and open another at a predetermined interval, or to operate signal after a certain time interval. Features large dials, sturdy frame construction permitting greater precision, and simplified screw mountings to conform to standard instrument practice. *The R. W. Cramer Co., Inc.*

IT'S NEW CHECK IT



(4) CORROSION SURVEY SERVICE uses Otis tubing caliper (known during development as the Chaney-Barnes tubing caliper). Successfully used in high-pressure wells, it detects and records both the extent and

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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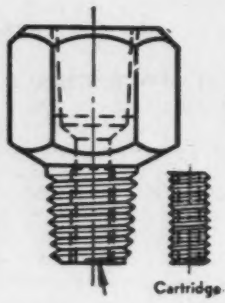
location of corrosion in tubing and accurately measures the depth of pits. Tubing with pitted areas shows on charts by erratic lines having peaks in proportion to the depth and extent of pitted areas. Runs on a steel measuring line. No packing gland; full well pressures are admitted to all parts of caliper. *Otis Pressure Control, Inc.*

IT'S NEW CHECK IT

(5) NEW CARTRIDGE SNUBBER is a little device that takes advantage of the use of powdered metal through which the pressure medium must pass. The compressed powdered metal, in the form of a cartridge, is made in various porosities for air or gas, for water or steam, or for oil. Found very effective for reducing or eliminating violent pressure pulsations. *Helicoid Gage Division, American Chain & Cable Co., Inc.*



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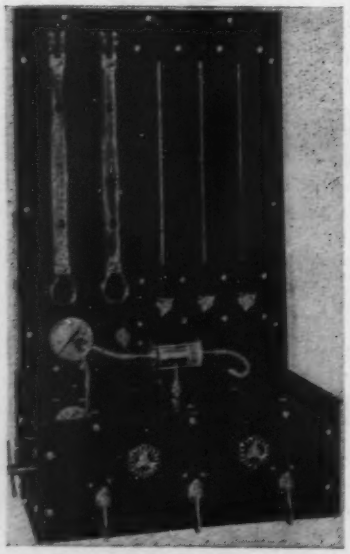
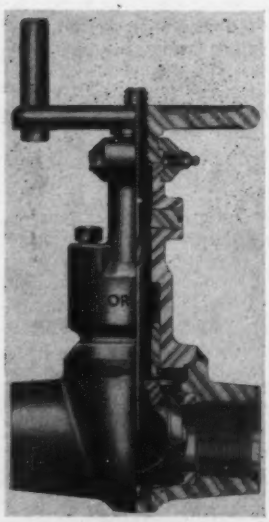
(6) RELATIVE PERMEABILITY APPARATUS will be used in new service. Relative permeability to gas is defined as the ratio of the effective permeability to gas at a given percentage saturation of gas in the pores, to the specific permeability of the porous medium at 100 per cent gas saturation. The apparatus measures the relative permeability to gas at a number of saturations covering the range normally encountered in reservoirs during pressure decline. Data are for estimating pressure decline and gas-oil ratios versus oil recovery. Relative permeability characteristics may show considerable variation among different reservoirs. This is important since the ratio of relative permeability of gas to that of oil governs the rate of increase of the produced gas-oil ratio and hence the rate of decline of reservoir pressure and ultimate recovery obtainable. Variations in gas relative permeability alone, other conditions equal, may cause as much as a twofold variation in ultimate recoveries. *Core Laboratories, Inc.*



IT'S NEW CHECK IT

(7) MUD-O-GRAF AUTOMATICALLY provides continuous record of weight of mud in the circulating system of a drilling well. Consists of weighing unit, installed in the flow line, or at the pump suction, and the recording unit placed conveniently to driller. With weighing units installed at both locations the dual record provides a comparison between "cut returns" from bottom and mud being returned to hole — extremely valuable where there is possibility of encountering gas pressure. Measures the differential pressure between two vertically spaced points in a predetermined volume of drilling mud. As the specific gravity of the mud varies, the differential pressure between these two points will vary in direct proportion thereto. *Warren Automatic Tool Co.*

IT'S NEW CHECK IT



(8) NEW FORGED STEEL VALVE for christmas trees, manifolds, etc. Features (1) welded bonnet, (2) plastic packing, (3) grease chamber, (4) rising type full-opening stem, (5) friction free seating. Seating surface on the rotating core is hard faced; seats against a corrosion resistant plastic seat. *Orbit Valve Co.*

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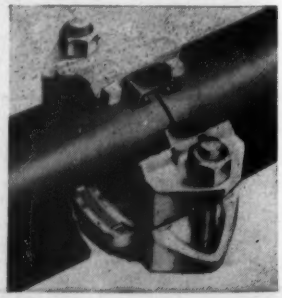
(9) "ROUST-A-BOUT" PIPE JOINT is a complete coupling made up of a triple-seal synthetic-rubber gasket and two half housings of malleable iron. For plain or beveled ends — new or used pipe. Only a simple socket wrench is required. In 2 to 6-in. sizes, working pressures to 1,000 psi. *Pipe Couplings, Inc.*



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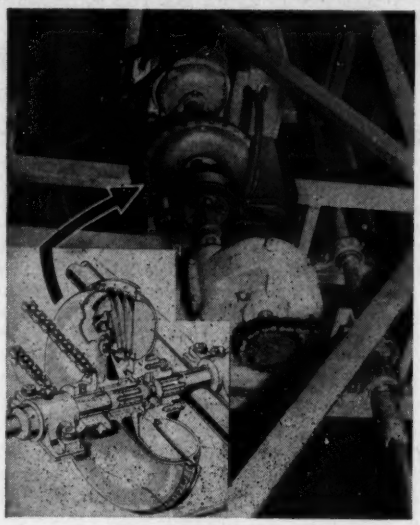
(10) FIREBAUGH FLUID-DRIVE COUPLING operates on the Vulcan-Sinclair principle, and eliminates necessity for both a transmission and differential mechanism. Can be installed directly on the shaft of any engine or elec-



tric motor. Engages and disengages without human control; slippage is eliminated. Wide variety of uses wherever smooth starting and stopping of power-driven equipment is necessary. *Toolcraft Manufacturing Co.*

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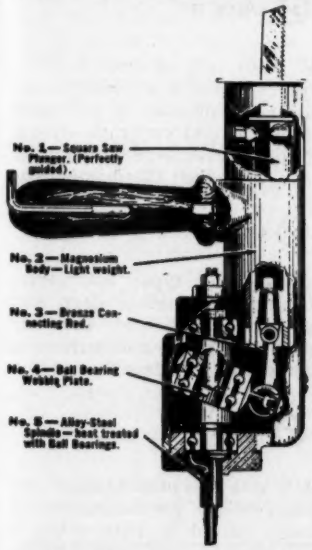
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No. 4—Ball Bearing Wobble Plate.
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(11) WYCO "HI-SPEED SAW. Attached to any ¼-in. electric drill, air drill, or flexible shaft, it saws and files metals, wood, and plastics. Chucks in drill chuck or collet—uses ordinary hack-saw blades and standard ¼-in.-shank machine files. True sawing assured by new square plunger with takeup for wear. Rotating parts are ball bearing, running in oil. No gears, no cams. *Wyzenbeek & Staff.*

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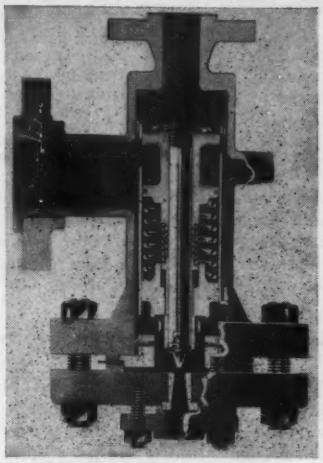
(12) SWIVEL PIPE COUPLING solves one of the most critical problems of transmission of hydraulic power. Combination of multiple packings and metallic seals plus double row of ball bearings protects against leakage at all pressures and lowest possible resistance to rotation. Made in sizes from ⅛ to 1 in. with threaded and elbow connections to meet particular applications. *Snyder Sales Corp.*

(13) AUTOMATIC RECIPROCATING VALVE eliminates centrifugal-pump failures resulting from insufficient flow of fluid through the pump. Operated from the fluid flow, it is designed to bypass the minimum quantity of fluid required to eliminate pump overheating. As the quantity of fluid passing through the pump increases, the bypass quantity is automatically throttled, is reduced to zero when the output of the pump is sufficient to prevent pump failure. Easily installed in existing pump piping. *Hammel-Dahl Co.*



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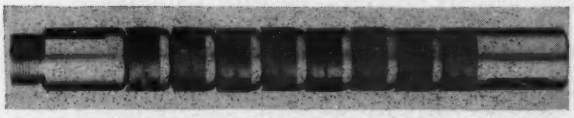

(14) G-B EXPAN-SEAL PUMP PLUNGER has a series of oil-resisting, synthetic rubber split rings on a steel core. In connection with metal spacers, these automatically expand to the pump-barrel wall on the lifting stroke, providing seal and preventing oil slippage. They contract and move off the cup seat on the return stroke, reducing friction and allowing any sand to be washed away with the oil. This action also allows any gas trapped between the pump valves to escape, preventing gas locking. Available in standard A.P.I. barrel sizes. *Gustin-Bacon Manufacturing Co.*

IT'S NEW CHECK IT

TRADE LITERATURE

(15) STEEL CASTING ENGINEERING REPORTS. Reports on mechanical properties of low-alloy (NE) cast steels, hardenability values, impact properties at room and subzero temperatures and other engineering data relating to carbon and alloy cast steels. Distributed at intervals to engineers, designers and others interested in results of continuing research and development. *Steel Founders' Society of America.*

IT'S NEW CHECK IT

(16) HOW TO ERECT CHAIN LINK FENCE. Useful to contractors and all others responsible for the installation and maintenance of chain link fence, this new catalog provides for the first time a complete instruction guide

covering all points in the erection of this type of steel fence. *Wickwire Spencer Steel Div.*

IT'S NEW ✓ CHECK IT

(17) PORTABLE CENTRIFUGAL PUMPING UNITS is the title of this catalog which contains specifications, operational illustrations, as well as performance and capacity curves for their line of pumping units. Originally designed for pipe-line service, the units vary in capacity and performance to be suitable for any installation. *John M. McGregor.*

IT'S NEW ✓ CHECK IT

(18) POWERHOISTS. New bulletin describes in detail 100 per cent air-controlled power rig for use with up to 750 hp. in drilling to depths of 10,000 ft. Complete specifications and installation diagrams are given. *International Derrick & Equipment Co.*

IT'S NEW ✓ CHECK IT

(19) SAFE WIRE-ROPE FASTENINGS. Handy new pocket-size information card on the use and application of wire-rope clips gives correct method of fastening clips, minimum number required, and different sizes of rope, together with application data for making safe wire-rope fastening. *American Hoist & Derrick Co.*

IT'S NEW ✓ CHECK IT

(20) REMOTE-CONTROL GAGING EQUIPMENT is the subject of this new eight-page pamphlet which features instantaneous indication of any number of tank levels from the central point. One indicating board can be coupled to as many tanks as desired. Depth given in feet, inches and fractional one-eighth inches. Pamphlet shows applications to different styles and shapes of tanks. *Telematic Corp.*

IT'S NEW ✓ CHECK IT

(21) COLOR CONVERSION CHART gives quick, accurate comparison between any of the 12 major color density scales used for fats and oils. Printed on sturdy cardboard, 8½ by 11 in., for easy use and filing. Valuable reference aid to laboratory, technical, production, and purchasing departments. *Armour Chemical Div.*

IT'S NEW ✓ CHECK IT

(22) PLATFORM TRAILERS of the fixed and self-loading type are shown in multicolor broadside released by well-known manufacturer. Structural details and photos of application are well presented. *American Body & Trailer Co.*

IT'S NEW ✓ CHECK IT

(23) "SELECTRODE CHART" has recently been issued as a guide to welders in the choice of correct electrodes for specific jobs. Designed for wall hanging, it contains specifications for mild steel, low alloy steel, stainless steel, nonferrous and cast iron, surfacing electrodes, and gas welding rods. *National Cylinder Gas Co.*

IT'S NEW ✓ CHECK IT

(24) "HEAT INSULATION FOR INDUSTRY" is revised edition of this manufacturer's catalog, which contains complete information on over 40 heat-insulation products, including asbestos, magnesia, diatomaceous earth, mineral wool, etc. In addition, it offers heat loss tables, selection charts, and data for determining insulation thickness, data on the comparative efficiencies of mechanical, thermal and performance characteristics. Insulating, bonding and refractory cements are also covered. *Philip Carey Manufacturing Co.*

IT'S NEW ✓ CHECK IT

(25) HYDROGEN. New 32-page booklet of easily understood text, numerous pictures, flow diagrams and tables, reviews the commercially useful methods for producing hydrogen. Streamlined, easy-to-read book, containing pertinent facts about commercial uses of hydrogen, which will prove a valuable addition to any library. *The Girdler Corp.*

IT'S NEW ✓ CHECK IT

(26) RUST PREVENTIVES. New catalog gives detailed information on rust preventives, protective coatings and related industrial chemicals. Each product is described and its uses, applications, methods and coverage shown. Includes oil type, solvent type, grease type and plastic type preventives and coatings. *Nox-Rust Chemical Corp.*

IT'S NEW ✓ CHECK IT

(27) PUMP BULLETIN illustrates 60 types and styles of vertical and horizontal pumps, including deep and shallow well pumps, high-lift pumps, and domestic water systems. Each type is illustrated and carries a brief description with characteristics. *Peerless Pump. Div.*

IT'S NEW ✓ CHECK IT

(28) "ALUMINIZED STEEL" is a 24-page booklet describing special-purpose sheet steels for resistance to heat and corrosion. Aluminum coated on both sides, it resists heat scaling up to 1,500° F., has good atmospheric corrosion resistance and good radiant heat reflectivity. Booklet is fully illustrated with charts, photographs and tables, and contains sections on heat reflectivity, mechanical properties, forming properties, etc. *The American Rolling Mill Co.*

IT'S NEW ✓ CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

Keep Informed. Save Time. Tear Out Card. Check It. Mail It.

REFINING

Catalytic Cracker Near Completion at Whiting

WHITING, Ind. — The $150,000,000 expansion program of Standard Oil Co. (Indiana) is proceeding under difficulties and cannot be completed this year, Dr. Robert E. Wilson, chairman of the board, told stockholders here last week.

However, one catalytic cracker at the Whiting refinery is 85 per cent complete and is expected to be placed on stream this summer. Construction of a second unit is just beginning but some problems are yet to be worked out, he said.

Dr. Wilson said the plan to build a catalytic cracker, vapor recovery plant, polymerization plant, power and water plants, engineering and research building, and tankage at Sugar Creek, Mo., has also been approved and the program is well under way. Applications for permission to proceed with work at Casper, Wyo., are in the engineering stage.

Pennsylvania Refining Company to Liquidate

OIL CITY, Pa.—Continental Refining Co. will liquidate its assets and dismantle its refinery here because of the lack of a sufficient supply of Penn-grade crude.

"Without crude, we are unable to continue refining operations, and find it necessary to liquidate the assets of the company and dismantle the plant," said A. B. Weingard, president.

"In the past few months, we have made strenuous efforts to secure other sources of supply of crude oil but have met with entirely disappointing and discouraging results. . . . We will, by every possible means, continue to market our brands of lubricating oils and specialty products in the 25 states where they are presently being distributed. It is with regret the officers of the company are compelled to make this announcement."

The Oil City refinery has a listed crude capacity of 1,000 bbl. daily, and cracking capacity of 400 bbl. daily. It is primarily a lubricating plant. Weingard said the company employed 105 people and had a monthly payroll of $25,000. The company has disposed of its outlets, including bulk plants and service stations in several Pennsylvania localities, to major companies.

East Chicago Plant to Have 35,000-Bbl. Daily Capacity

BARTLESVILLE, Okla.—Further information on the $18,000,000 expansion of the East Chicago, Ind., refinery of Cities Service Oil Co. (Del.), was disclosed last week by A. W. Ambrose, president of the company.

The new facilities, which will include the latest type fluid catalytic cracking unit, will increase the capacity of the East Chicago plant to 35,000 bbl. daily. Present capacity is listed at 30,000 bbl. daily crude, and 18,000 bbl. daily cracking.

The entire job, from design to construction, will be under the supervision of M. W. Kellogg Co., and is scheduled for completion in the spring of 1948. Other new equipment to be included in the East Chicago expansion program will be a feed preparation unit, polymerization plant, gas recovery equipment, additional tankage for both crude oil and finished products, increased steam generating capacity and enlarged laboratory, and pump-house and change-house facilities.

The new facilities and increased capacity at East Chicago will enable Cities Service to supply its marketing outlets in 36 states with products from centrally located refineries, the announcement said. In addition to East Chicago, Cities Service operates the 100,000-bbl. daily Lake Charles, La., refinery, and six other plants, located in Ponca City, Okla., Petty's Island and Linden, N. J., Titusville, Penn., and East Braintree, Mass.

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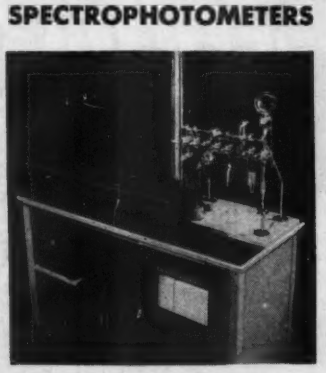
The "Transparent" is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

BECKMAN IR-2 INFRARED SPECTROPHOTOMETERS



This is the most advanced instrument available for hydrocarbon gas analysis and control. The accuracy, simplicity and wide adaptability of this instrument are thoroughly proven by years of refinery use.

The Beckman IR-2 incorporates many unique features. It is hermetically sealed . . . has integral amplifiers . . . direct reading scale . . . no galvanometers . . . eliminates temperature corrections . . . and many other vital advancements.

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QUARTZ SPECTROPHOTOMETER
widely used in the control of aromatics, butadiene and similar refinery products which are more readily analyzed with ultraviolet than with infrared light.

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NATIONAL TECHNICAL LABORATORIES
SOUTH PASADENA, CALIFORNIA

Silicone Oils Improve Instrument Performance

PITTSBURGH.—An improvement in the performance of aircraft instruments using silicone oils as a lubricant has been reported by Westinghouse Electric Corp., after tests.

C. H. Braithwaite, Jr., a company engineer, conducted the tests. Silicones are formed by rearranging the molecules of sand, coal, oil, and brine. The result consists of fluids and soft greases with heat and cold-resisting properties and a basic ingredient of resins and varnishes which withstands heat when used as insulation.

Braithwaite, explaining the aviation industry has been searching for an instrument lubricant satisfactory in both extreme heat and in subzero temperatures, said the silicone oils "protect ball and needle bearings against corrosion in tropical climates

Wilcox Refinery to Close Unless Crude Is Obtained

OKLAHOMA CITY. — The Wilcox Oil & Gas Co. refinery at Bristow, Okla., is faced with a complete shutdown and may have to close within 2 weeks if an additional 1,500 to 2,000 bbl. of oil daily is not allowed by the Corporation Commission, according to W. M. Dunn, president of the company.

The commission was told that storage at the plant on April 15 amounted to 102,000 bbl., but was being reduced rapidly. The refinery purchases crude from stripper wells in the Okmulgee and Stroud districts.

Socony-Vacuum Develops Waterproofing Material

NEW YORK.—Leakage in outside walls of brick and stucco buildings can be corrected by application of a transparent waterproofing wax emulsion, according to Socony-Vacuum Oil Co., Inc., its manufacturer. It is said to possess many advantages over other waterproofing materials. The emulsion, known as S/V Ceremul W, is put on by brush. It is diluted in one or two parts of water, depending on how porous the surface is to which the waterproofing is applied. Only one application is required. Application is preferable in warm weather so that rapid drying will result.

Hydrocarbon Tables Report Issued by A.P.I. Group

WASHINGTON.—A report on the status of tables of physical and thermodynamic properties of hydrocarbons and catalogs of infrared and ultraviolet spectrograms has been issued by the American Petroleum Institute Research Project 44, a cooperative activity maintained by the institute at the National Bureau of Standards and at the University of California.

The project is headed by an advisory committee composed of Wayne E. King, The Texas Co., chairman; Otto Beeck, Shell Development Co.; Gustav Egloff, Universal Oil Products Co.; and Stewart S. Kurtz, Sun Oil Co. Copies of tables and spectrograms will be supplied free to Government laboratories, college chemistry and physics departments and supporters of A.P.I.'s research fund. A nominal charge is made for sets supplied to other individuals and organizations.

WAA to Sell Toluene On Pro Rata Basis

WASHINGTON.—War Assets Administration announced last week that 11,200,000 gal. of surplus toluene, offered in a nation-wide sale which ended May 13, would be distributed on an allocation basis to purchasers.

The sale was oversubscribed by 33,800,000 gal. WAA allocated one tank car of approximately 8,000 gal. to orders of 50,000 gal. or less, and 20 per cent of the quantity requested on all orders above 50,000 gal.

The toluene was offered for unrestricted use at 10 cents per gallon, f.o.b. storage location, in minimum tank car lots.

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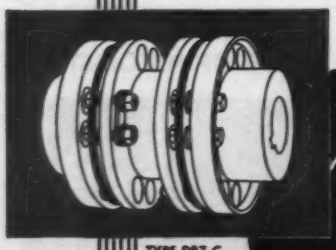

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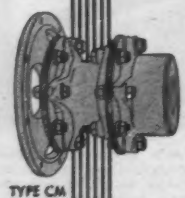

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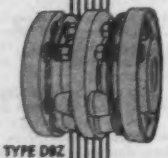

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The Thomas All-Metal Coupling does not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.

Write for Complete Engineering Catalog!

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WARREN, PENNSYLVANIA

PIPE LINES

Warren Due to Open New Line This Week

HOUSTON.—Warren Petroleum Corp. was scheduled to complete tests and begin operations this week on the north section of its new $2,000,000 pipe line in the Houston area.

The north section of the line extends from Superior Oil Co.'s cycling plant in the Lake Creek field, Montgomery County, to Warren's tidewater terminal at Norsworthy. This line consists of about 29 miles of 6-in. and about 21 miles of 8-in. This larger section is planned to accommodate future additional loads.

The south end of the line is due for completion early in August. It extends from Norsworthy to Texas City and is about 32 miles in length. This 6-in line includes a number of laterals which will carry volatile blending agents to various refineries in the area. The existing system of Hanlon-Buchanan, Inc., recently purchased by Warren, will be tied into that being built by Warren. Warren is erecting additional tankage at both Norsworthy and Texas City.

Texas-New Mexico Company Plans 470-Mile Crude Line

HOUSTON. — Texas - New Mexico Pipe Line Co. has announced plans for increasing its outlet capacity from the Permian Basin of West Texas by laying of a new 470-mile 16-in. line from Crane, Tex., to Houston.

It is understood the new pipe line, paralleling the company's existing 12-in. carrier, would carry sour crude, while the 12-in. line would be converted to handle sweet crude.

While right-of-way is being obtained for the new line at this time, completion is not scheduled until 1947, due to the late delivery schedule of pipe line. Capacity of the new 16-in. system is estimated at 80,000 bbl. daily. The present 12-in. line has a capacity of 65,000 bbl. daily. Cost of the program is estimated at $12,000,000.

Majority stockholder in the Texas-New Mexico company is The Texas Co., with the remaining stock held by Sinclair Refining Co., Cities Service Oil Co., and Tide Water Associated Oil Co.

Bell Buys North Texas Crude Gathering System

Bell Oil & Gas Co. has purchased from Sinclair Refining Co., pipe line department, the portion of Sinclair's gathering system which has been running oil in the Sunshine Hill and Clara district in Wichita County, Texas.

The Bell system, originating at Burkburnett, Tex., was contiguous to the Sinclair system, crossing it at several points. The Sinclair system will be tied into Bell's system at a point a few miles south of Clara, Tex. Bell took control June 1.

The Bell company is planning some immediate improvements and extensions to the new line and will be able to handle considerably more oil from the Clara and Sunshine Hill districts than has hitherto been possible. There is considerable drilling activity in the Sunshine Hill district and as a result of the extensions Bell anticipates securing many new connections, company officials said. The crude thus secured provides additional supplies for Bell's refinery at Grandfield, Okla., are represents the third gathering system that the Bell has purchased over a period of years to augment its supply of crude.

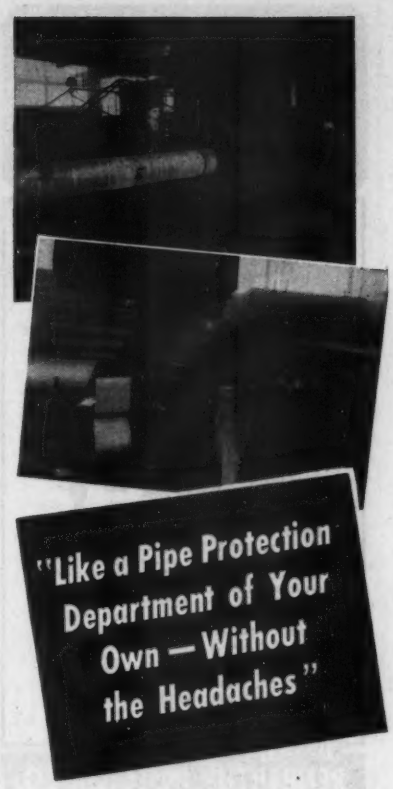
Interstate Completes New Extension in Louisiana

Interstate Oil Pipe Line Co. has completed and placed in operation 5 miles of new 6-in. line to the Bayou Perot field in the marsh lands of LaFourche Parish, Louisiana.

Swamp construction methods were used to lay the line which extends from the Woodpecker gate plant on the Delta Farms spur to the field. The line consists of 18.97 lb. lapweld

BUCKEYE MAINLINERS
for faster digging of trenches for crude lines. Digs trench 24" to 39" wide — up to 8½' deep.

BUCKEYE TRACTION DITCHER COMPANY
Findlay, Ohio
Built by Buckeye
TRENCHERS, SHOVELS, CRANES
BACKFILLERS, TRACTOR EQUIPMENT



When you give Pipe Line Service a job of coating and wrapping pipe, you have the close cooperation that you'd expect only from a department of your own, without any of the headaches of equipment and personnel.

These experienced pipe protection specialists offer you a complete service at six strategically located plants that relieves you of all responsibility. You simply select the specification you want and Pipe Line Service does the rest.

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COMPLETE SERVICE
Through Strategically Located Plants
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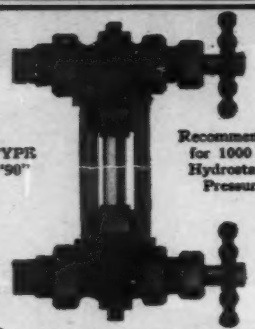
LIQUID LEVEL GAGES



Made of Chromium-Molybdenuin alloy temperature resisting steel, extra heavy throughout and stainless steel trimmed. Positive automatic shut-off; stainless steel balls shut off the flow of liquid if glass breaks. Regrinding removable seats, heavy duty stuffing boxes, union connections. Conform with A.P.I.—A.S.M.E. requirements.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

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- High velocity gas, jetting through enlarged by-pass, sweeps debris ahead of Pig.
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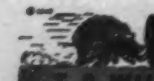
Types BC and SCH Pigs available for cleaning gas lines smaller than 16-inch.



THE PIG WITH THE POKE CLEANS PIPE LINES
T. D. WILLIAMSON, Inc.

pipe and is welded throughout. The pipe is protected from corrosion by petroleum pipe coating and an asbestos asphalt impregnated wrapper, one coating on the pipe and one coating over the wrapper.

Previously, oil from Bayou Perot field has been barged to the Delta Farms stations and inducted into the pipe line at that point.

Also newly completed by Interstate is a section of 8-in. pipe line extending slightly more than 10 miles from Eucutta field in Wayne County, Mississippi, to the Heidelburg terminal. This line allows tank-car shipment from Heidelburg of all crude handled by Interstate in both Eucutta and Heidelburg fields. The pipe is 28 lb. lapweld, protected in a manner similar to the Bayou Perot spur.

With the line in operation, about 14,000 bbl. daily will be shipped from the Heidelburg terminal—6,000 bbl. from Eucutta and 8,000 bbl. from Heidelburg. Oil from Eucutta formerly was shipped from the Hiwanee loading rack.

Toronto Pipe Line Buys Texas Gathering System

HOUSTON. — Scurlock Pipe Line Co. this week announced the sale of its pipe line gathering system in DeWitt, Karnes, Goliad, and Bee counties, Texas, to the Toronto Pipe Line Co.

Scurlock Pipe Line's system is connected to the Slick Wilcox field in Goliad County and to approximately twenty other oil fields in the general area.

Toronto Pipe Line Co. took over operations of the Scurlock system June 1, and is continuing to purchase the allowable crude oil from wells connected to the system, amounting to approximately 10,000 bbl. per day.

Toronto Pipe Line is affiliated with British American Oil Producing Co. Toronto owns and operates pipe line transportation systems in the East Texas field and in Illinois, Indiana, Montana, and Wyoming.

Nine Projects Scheduled By Anderson Brothers

Nine pipe line projects under contract for construction by Anderson Brothers, pipe line contractors, were listed by the company this week. The projects follow:

1. Removal of approximately 26 miles of 8-in. crude oil line from Benton, Ill., to Hoodville, Ill., for Sohio Pipe Line Co., now under way.
2. Removal of approximately 9 miles of 8-in. crude oil line from Enfield, Ill., to Hoodville, Ill., for Ohio Oil Co., now under way.
3. Construction of approximately 40 miles of 8-in. line. Line extends from Tinsley, Miss., to Mayersville, Miss., now under way. This contract is with the Sohio Southern Pipe Line Co.
4. Construction of a gathering system in the Carthage, Tex., field for the Arkansas Louisiana Gas Co., now under way.
5. Installation of 8-in. and 14-in. line from ship unloading dock to bulk storage plant at East Providence, R. I., for the Colonial Beacon Oil Co., now under way.
6. Construction of approximately 70 miles of 14-in. line from Means, Ky., to Foster, Ky., for the Cincinnati Gas & Transportation Co., to commence about June 15.
7. Reconditioning of approximately 52 miles of 8-in. line for the Michigan Consolidated Gas Co., to commence about June 15.
8. Construction of approximately 9 miles of 8-in. line at Davis, W. Va., for Ohio Oil Co., now under way.
9. Construction of Toe drainage system at the Sardis dam at Batesville, Miss., now under way.

Hearing Set June 10

WASHINGTON. — The application of Mississippi River Fuel Corp., St. Louis, for authority to construction additions to its gas transmission system has been set for hearing June 10 in St. Louis before the Federal Power Commission.

WHEN YOU WANT
The Best
IN
PIPELINE CONSTRUCTION
OKLAHOMA CONTRACTING COMPANY
DALLAS TEXAS
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APARTADO 1085
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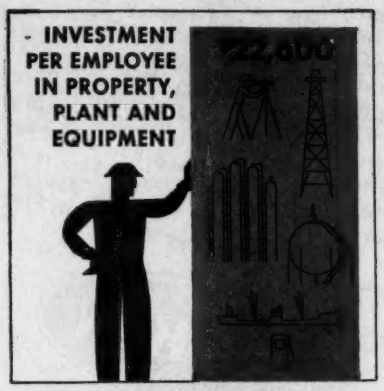
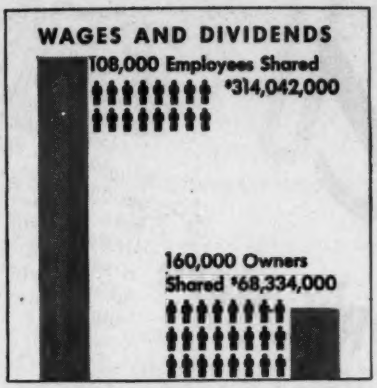
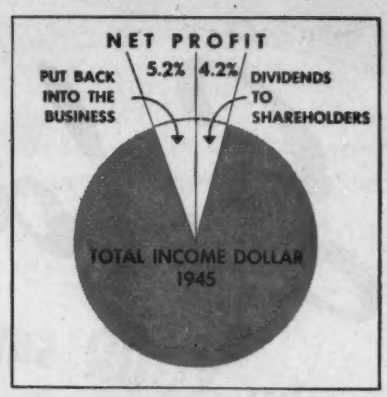


FOR EACH EMPLOYEE ON THE PAYROLL Jersey and its consolidated companies have invested $22,600 in property, plant, and equipment. The gross value of capital investments in lands, refineries, pipe lines, tankers and other properties necessary to provide 108,000 jobs was $2,441,942,488 at the end of 1945.



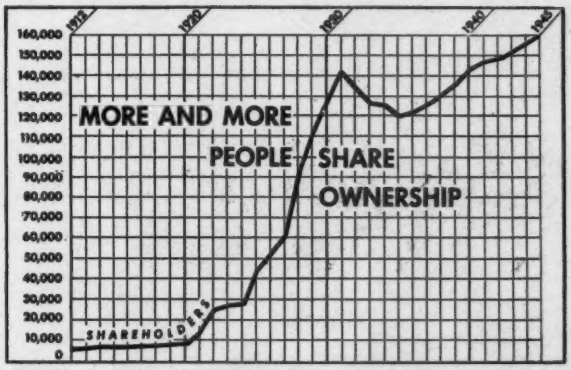
EACH FIGURE REPRESENTS 6,750 PERSONS, and the bars represent the amounts of income each group received from Jersey in 1945. The sum of $314,042,000 was paid to employees of the Company and affiliates in wages, salaries and benefits. Dividends amounted to $68,334,000.



THIS SHOWS THE PROPORTION OF NET PROFIT made by Jersey and affiliates out of total income in 1945. It shows also the proportion paid to shareholders in dividends and that left in the business to meet future capital expenditures, etc. All the rest of the income was required to pay wages, purchase materials and meet other operating costs.

Marketing Everywhere, throughout the war, marketing activities were largely regulated by government directives, and when these were ended in the United States and in some foreign areas there was a rapid return to normal competitive activity. World-wide sales of refined products in 1945 were at the rate of 1,193,000 barrels per day, an increase of 4 percent over 1944. Of this amount 694,000 barrels per day were sold in the United States domestic market.

Research Until the end of hostilities Jersey research was almost entirely on war work of highest importance. Immediate postwar research budgets will be approximately 50 percent above prewar budgets as part of a program to carry over into a peace-time world research begun for war, and to continue scientific inquiries on petroleum as a raw material for many products.



WIDENING OWNERSHIP OF JERSEY is shown by the fact that the number of shareholder accounts has increased from 5,816 in 1912 to 160,025 as of December 31, 1945.

Employee Relations Jersey and affiliates continued to enjoy excellent labor-management relations. When the war ended, Jersey's domestic petroleum affiliates proposed upward adjustment in wages and salaries of 15 percent. This was accepted by all employee bargaining agencies involved. By March 1, 1946, an additional 3 percent had been negotiated and accepted. One of the best evidences of the satisfactory employee relationships in Jersey is the fact that 95 percent of the domestic employees who have been released from the armed forces have returned to the Company.

More than 79 percent of eligible domestic employees are now buying term life insurance under the Group Insurance Program for a total coverage of $160,241,800.

Employees participating in the Thrift Plan contributed last year $15,019,011, which was supplemented by Company contributions of $18,921,235.

Earnings Consolidated net earnings in 1945 amounted to $154,156,196, equivalent to $5.64 per share. For 1944 the consolidated net earnings were equivalent to $5.69 per share. During the year the Company paid dividends totaling $2.50 per share.

Statement of Principles In order to make as clear as possible the Company's outlook in today's changing world, the Board of Directors has prefaced this year's Annual Report with a special *Statement of Principles*. This expresses, for our stockholders and for anyone else interested, basic viewpoints and policies of the Company.

[*Copies of the full report are available on request. Address Room 1626, 30 Rockefeller Plaza, New York 20, N. Y.*]

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AND AFFILIATED COMPANIES

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Larkin was the pioneer in standardization of Swage Nipples and Bull Plugs back in 1930. The improved design, quality materials and skilled workmanship have been continuously improved all down through the years. Uniform, leak-proof Swage Nipples and Bull Plugs are a specialty . . . not a side-line . . . at Larkin. They're all alike . . . whether you buy one or a thousand. Ask your supply store about Larkin Swage Nipples and Bull Plugs.

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West Coast: Howard Supply Company
Rocky Mountain: E. J. Longyear Company
Export: 19 Rector Street, New York 6, N. Y.

Natural Gas

Bureau of Mines Outlines Peacetime Helium Uses

WASHINGTON.—The United States Bureau of Mines says abundant quantities of helium are now available for private enterprise—as much as 10,000,000 cu. ft. per month—and that peacetime uses of this gas may overshadow its wartime performance.

Backed by the experience of more than a quarter of a century of production, the bureau now can furnish a supply of helium for industrial and medical uses and still continue to meet demands of military and government agencies, the bureau said in a new publication. The bureau is the world's only commercial helium producer.

Wartime expansion of the bureau's production facilities at plants in the southwest have elevated helium from its 1915 place as a laboratory curiosity costing about $2,500 per cubic foot to its present position of abundance among the nation's resources costing about 1 cent a cubic foot, the publication said.

As a new industrial tool, helium in peacetime will continue to alleviate human suffering in the treatment of certain respiratory ailments, assist in the expansion of a number of newly-developed metallurgical processes, serve as a tracer in determining underground migrations in gas and oil reservoirs, minimize explosion dangers in the use of some anesthetics, and reduce, and when mixed with pure oxygen, reduce or eliminate the painful caisson disease, commonly called "the bends," according to the publication.

Author of the bureau publication on the properties and uses of helium, Henry P. Wheeler, Jr., petroleum engineer, relates that several additional uses for helium have been suggested, but not thoroughly tested. These include use as an inert atmosphere in metallurgical and other operations; to fill spaces between multiple optical lenses; as a tracer material to determine air movement and the efficiency of air-conditioning systems, and as a chemical raw material.

Rate Hearing Set

WASHINGTON. — The Federal Power Commission has ordered a new hearing August 13 at Minneapolis, Minn., on its order directing Montana-Dakota Utilities Co., Minneapolis, to reduce rates for transportation of natural gas.

April Natural Gas Sales Show Slight Decline

NEW YORK.—Sales of natural gas for the month of April and the 12-month period ending April 30 decreased slightly due to a drop in wartime industrial production, according to the American Gas Association's monthly report.

Natural gas sales for April 1946 of 1,909,336,000 therms (unit of measurement equivalent to about 100 cu. ft.), decreased 2.2 per cent under last year. Total sales for the 12-month period ending April 30, 1946, were 21,878,035,000 therms, representing a decline of about 2.8 per cent under the comparable period a year earlier.

Sales of manufactured and mixed gas increased 1.7 per cent 12 months ended April 30, 1946, with a total of 2,973,487,000 therms.

Rosselyn Gas Co. Converting From Mixed to Natural Gas

WASHINGTON.—Beginning in July, Rosselyn Gas Co., Rosselyn, Va., will receive straight natural gas for distribution to its customers in place of the mixed gas now sold, according to an application before the Federal Power Commission.

The application was filed by Washington Gas Light Co. for authority to contract a new 16-in. pipe line to serve Rosselyn. The application stated that during the summer of 1946 the change-over to natural gas will be made of all gas supplied by Washington Gas Light to its subsidiaries in Virginia and Maryland.

State Jurisdiction Denied

Efforts of the State of Indiana to take regulatory jurisdiction over direct industrial sales of natural gas have been rejected in a decision of the state Circuit Court in a case involving Panhandle Eastern Pipe Line Co., according to a report.

Natural Gasoline

March Production of Light Products Drops

WASHINGTON. — Production of natural gasoline and allied products during March dropped 7 per cent, according to the Bureau of Mines' monthly summary. Daily average output for the month was 12,632,000 gal., compared with 13,516,000 gal. in February and 12,902,000 gal. for March 1945. Decreases were reported in nearly all but the central states.

Stocks of natural gasoline and allied products continued to mount as the demand ran behind that of the first quarter of last year. Total stocks at terminals and refineries on March 31 stood at 279,656,000 gal., an increase during the month of 245,400 gal., or 12.2 per cent. Of the March total, 88,116,000 gal. was at refineries while stocks at plants and terminals were 191,540,000 gal. The greatest increase occurred at plants and terminals in Oklahoma and Texas.

Total demand for natural gasoline and allied products at the end of the first quarter, 1946, was running about 10 per cent under that for the same period in 1945. Figures supplied by the Bureau of Mines showed the first quarter, 1946, demand at 1,133,797,000 gal., against 1,199,471,000 gal. for the first quarter of 1945. March demand at plants, however, was 370,016,000 gal., against 359,142,000 gal. in February.

Production at the end of the first quarter, 1946, totaled 1,185,074,000 gal., compared with 1,170,938,000 gal. in 1945, an increase of 1.2 per cent.

Plymouth Oil Planning New Plant in Texas

SINTON, Tex.—Plans are expected to be complete within the next few weeks for a combination low-pressure natural gasoline, pressure-maintenance, and cycling plant to be built by Plymouth Oil Co. in the Plymouth field, San Patricio County, Texas.

Approximately 45,000,000 cu. ft. of gas daily will be processed, and the products will be separated into liquefied petroleum gas, natural gasoline, stabilized distillate, and crude oil. Six 800-hp. engines will be used for compressing and processing the gas and returning it to the producing horizons. Engineering and construction work on the plant will be in charge of the engineering and construction division of Jones & Laughlin Supply Co.

STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JUNE 1, 1946

	Total of all wells					Cum. to date		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	33	16	0	*17	49,986	651	537	0	0	0	0	0	0	0	0	0	0
Pennsylvania	86	38	12	†36	136,532	1,675	1,556	0	0	0	0	0	0	0	0	0	0
West Virginia	8	1	5	2	19,151	282	323	0	0	0	0	0	0	0	0	0	0
Ohio	21	3	11	7	53,237	471	338	0	0	1	1	2	2	0	10	17	29
Indiana	4	3	0	1	7,937	130	69	0	0	0	0	0	1	0	0	8	9
Kentucky	6	4	1	1	12,063	181	158	0	0	0	0	0	2	0	0	15	17
Illinois	29	19	0	10	66,615	856	656	0	0	0	2	2	17	0	0	147	164
Michigan	21	5	5	11	50,538	308	309	0	0	1	7	8	8	0	3	99	110
Kansas	36	19	3	‡14	120,137	811	652	2	0	0	3	5	13	0	3	97	113
Neb., Mo., Iowa	0	0	0	0	0	7	12	0	0	0	0	0	0	0	0	4	4
Oklahoma	41	23	1	§17	137,463	959	982	1	0	2	7	10	29	0	16	120	165
Texas	142	76	5	61	524,665	3,327	2,980	5	3	0	33	41	84	20	9	523	636
North Central	60	32	1	27	126,637	1,183	854	1	0	0	11	12	23	0	0	211	234
West	20	15	0	5	85,865	686	801	0	0	0	4	4	23	0	0	73	96
Panhandle	6	3	1	‡2	19,669	148	229	0	0	0	1	1	0	0	0	5	5
Eastern	9	7	0	2	57,684	314	129	2	0	0	2	4	9	0	1	41	51
Gulf Coast	30	17	3	10	188,178	754	692	1	3	0	7	11	22	15	4	110	151
Southwest	17	2	0	15	46,632	242	275	1	0	0	8	9	7	2	4	83	96
Louisiana	36	14	0	12	185,542	555	408	3	0	0	2	5	28	5	3	72	108
Northern	12	7	0	5	51,543	296	135	0	0	0	2	2	5	0	0	42	47
Southern	14	7	0	7	136,999	250	273	3	0	0	0	3	23	5	3	30	61
Arkansas	1	0	0	1	3,504	73	74	0	0	0	1	1	3	0	0	12	15
Mississippi	5	3	0	2	32,052	98	143	0	0	0	0	0	1	0	1	23	25
Southeastern States	0	0	0	0	0	18	20	0	0	0	0	0	0	0	0	15	15
Montana	9	4	2	3	21,860	110	128	2	0	0	1	3	6	0	0	11	17
Wyoming	4	3	1	0	18,567	69	84	0	0	0	0	0	8	0	3	20	31
Colorado-Utah	1	1	0	0	6,762	50	13	0	0	0	0	0	3	0	0	8	11
New Mexico	1	1	0	0	7,833	149	196	0	0	0	0	0	2	0	0	19	21
California	29	25	0	4	104,073	750	969	0	0	0	4	4	4	0	2	94	100
Total United States	503	258	46	199	1,561,517	11,530	10,607	13	3	4	61	81	211	25	50	1,304	1,590
Total previous week	543	309	45	189	1,774,982	11,027	10,096	9	3	3	66	81	198	22	46	1,343	1,509
Total June 2, 1945	509	279	41	189	1,841,629	10,607	9,187	9	2	4	73	88	838	8	55	1,353	1,654

Service wells included: *17, †34, ‡1, §2.

MARKET QUOTATIONS

(Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gal. as of last Monday.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-80†	73-75
Mid-Continent*	6.375-6.625	5.625-5.875
Texas Gulf Coast	6.375	5.750
New York Harbor	7.375	6.375
California		6.00-6.875

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades:	36-70	18-55
Oklahoma (Group 3)	3.250	3.900
N. Texas (f.o.b. plant)	2.750	3.300
N. Louisiana (f.o.b. plant)	3.125	3.750
California	4.875	5.500

CRUDE-OIL PRICES

Representative posted schedules per bbl

East Texas	$1.35
Conroe	1.53
Tepetate, Louisiana, avg. grav.	1.20
Illinois Basin	1.47
Pecos County, Texas	1.05
Bradford, Pennsylvania	2.10
Van, Van Zandt County, Texas	1.18

Note: Exclusive of subsidy.

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$0.90			
19-19.9	.94		$1.16	$0.80
20-20.9	.98	$0.95	1.18	.82
21-21.9	1.02	.97	1.20	.84
22-22.9	1.06	.99	1.22	.86
23-23.9	1.10	1.01	1.24	.88
24-24.9	1.13	1.03	1.26	.90
25-25.9	1.17	1.05	1.28	.92
26-26.9	1.21	1.07	1.30	.94
27-27.9	1.25	1.09	1.32	.96
28-28.9	1.28	1.11	1.34	.98
29-29.9	1.30	1.13	1.36	1.00
30-30.9	1.33	1.15	1.38	1.02
31-31.9		1.17	1.40	1.04
32-32.9		1.19	1.42	1.06
33-33.9		1.21	1.44	1.08
34-34.9		1.23	1.46	1.10
35-35.9		1.25	1.48	1.12
36-36.9		1.27	1.50	1.14
37-37.9		1.29	1.52	1.16
38-38.9		1.31	1.54	1.18
39-39.9		1.33	1.56	1.20
40 and above		1.35	1.58	1.22

*Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT

Week ended May 25.

(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks: Gasoline	Distillate	Residual
East Coast	806	22,901	10,556	8,133
Appalachian	158	3,595	477	376
Ill., Ind., Ky.	788	20,273	4,222	3,321
Okla., Kan., Mo.	395	8,152	1,781	1,143
Inland Texas	234	3,080	319	637
Tex. Gulf Cst.	1,151	14,763	5,667	4,882
La. Gulf Cst.	329	3,785	1,652	1,295
N. La., Ark.	60	1,805	388	192
Rocky Mtn.	135	2,299	421	785
California	801	15,116	7,490	22,604
Total 5-25-46	4,857	95,769	32,973	43,368
Total 5-18-46	4,756	97,050	32,186	41,875
Total 5-26-45	4,996	88,361	29,246	38,891

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
May 18, 1946	222,113,000
May 11, 1946	221,615,000
May 19, 1945	221,861,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	June 1 crude oil	Bureau of Mines May demand	May 25 crude oil
Alabama	1,200	700	1,100
Arkansas	78,450	79,000	77,850
California	860,350	840,000	868,750
Colorado	28,770	23,000	28,140
Eastern	62,900	62,900	66,350
Florida	250	200	250
Illinois	211,800	204,000	209,600
Indiana	19,850	16,400	19,000
Kansas	263,850	252,000	270,150
Kentucky	30,500	30,000	30,650
Louisiana	380,150	380,000	379,650
North Louisiana	88,700	.....	88,200
South Louisiana	291,450	.....	291,450
Michigan	45,550	46,000	48,050
Mississippi	64,950	53,000	63,150
Montana	23,650	22,000	23,660
Nebraska	750	800	750
New Mexico	95,300	99,000	95,300
Oklahoma	378,750	370,000	372,900
Texas	2,114,800	2,050,000	2,114,800
East Texas	388,800	.....	388,800
East Central Texas	139,600	.....	139,600
North Central Texas	164,800	.....	164,800
Texas Panhandle	83,000	.....	83,000
West Texas	521,100	.....	521,100
Southwest Texas	331,500	.....	331,500
Texas Gulf Coast	486,000	.....	486,000
Wyoming	106,190	97,000	106,020
Total United States	*4,768,010	4,626,000	4,776,120

Change from previous week down 8,110

Total production January 1-June 1 ..... †711,440,609 bbl.

Same period last year (crude plus condensate).. 726,624,600 bbl.

*Not incl. 25,650 bbl. condensate. †Incl. 3,874,800 bbl condensate.

CRUDE-OIL STOCKS 222,113,000 bbl. as of May 18—up 498,000 bbl. One year ago 221,861,000 bbl.

GASOLINE STOCKS 95,769,000 bbl. as of May 25—down 1,281,000 bbl. One year ago 88,361,000 bbl.

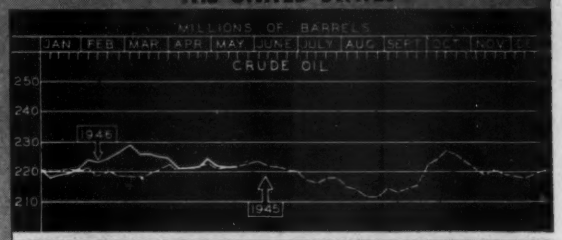
RESIDUAL FUEL-OIL STOCKS 43,368,000 bbl. as of May 25—up 1,493,000 bbl. One year ago 38,891,000 bbl.

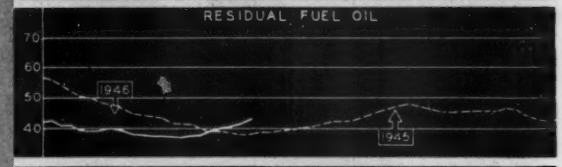
GAS OIL AND DISTILLATE STOCKS 32,973,000 bbl. as of May 25—up 787,000 bbl. One year ago 29,246,000 bbl.

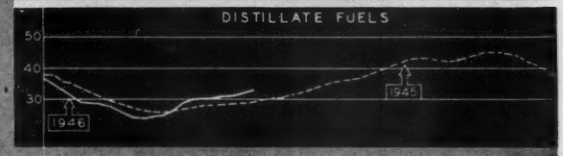
CRUDE-OIL PRODUCTION 4,768,010 bbl. as of June 1—down 8,110 bbl. One year ago 4,853,050 bbl.

REFINERY RUNS 4,857,000 bbl. daily week ended May 25—up 101,000 bbl. One year ago 4,996,000 bbl.

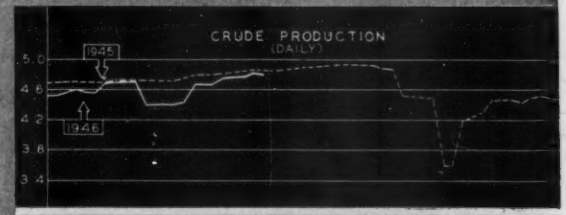
OIL STOCKS IN THE UNITED STATES

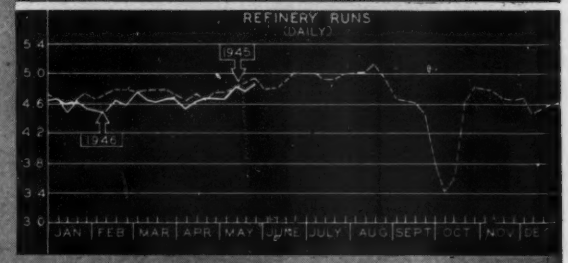




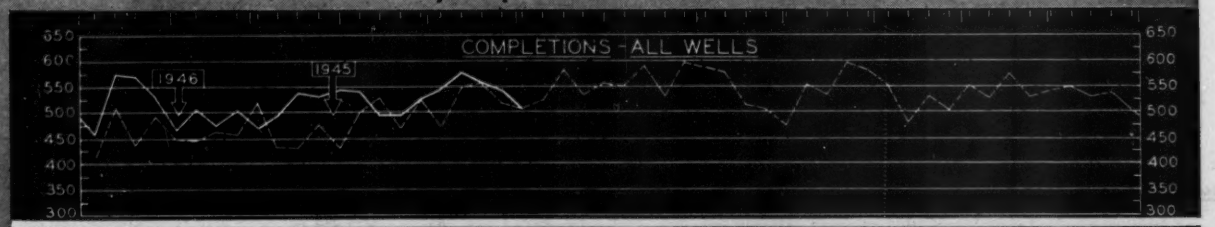


DAILY OPERATIONS



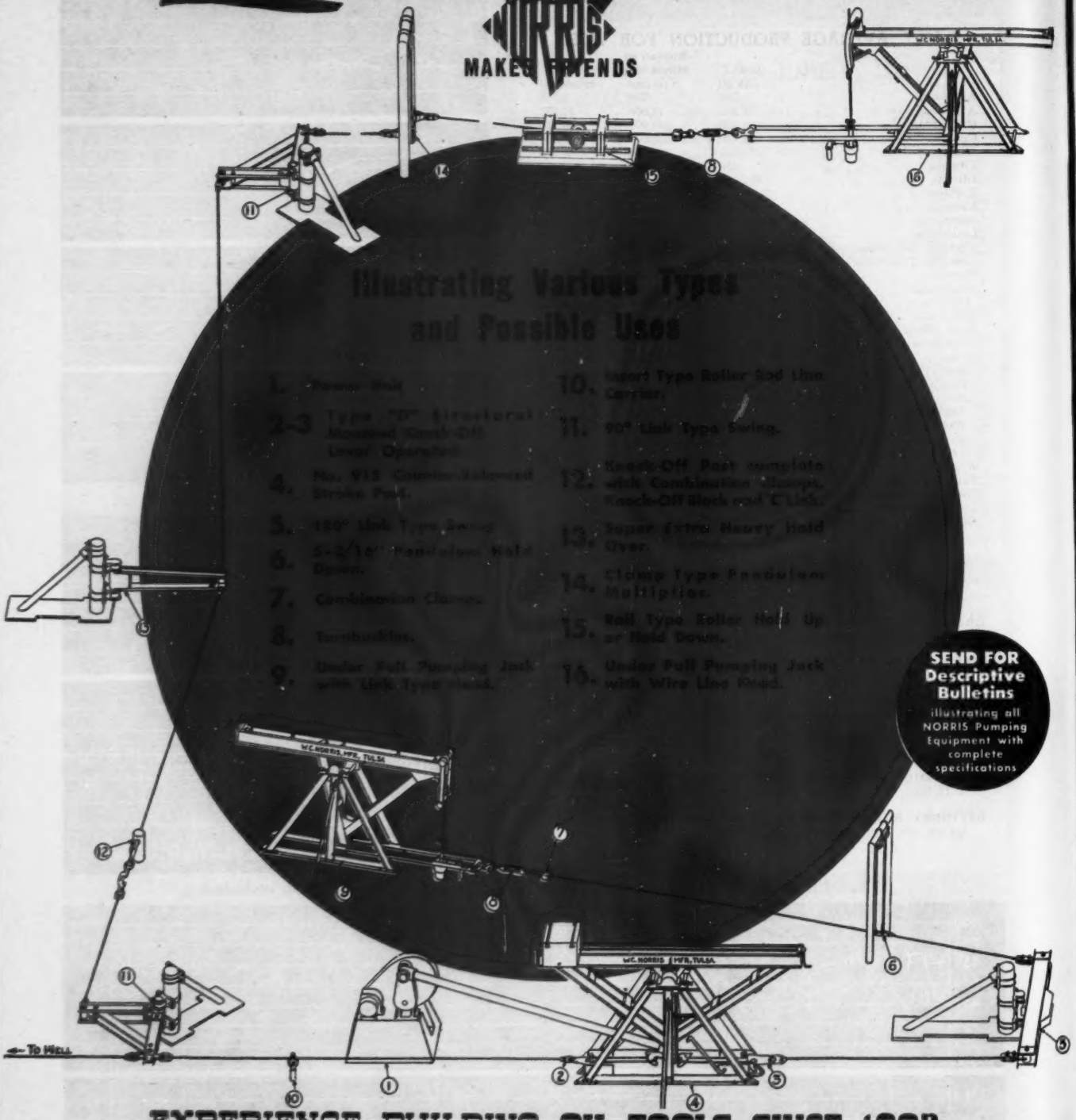


Solid line charts weekly completions, service wells in Eastern area included



NORRIS *Quality* PUMPING EQUIPMENT

QUALITY NORRIS MAKES FRIENDS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4. No. 912 Counter-Balanced Stroke Pump.
5. 180° Link Type Swing.
6. 5-2/16" Pendulum Hold Down.
7. Combination Clamps.
8. Turnbuckles.
9. Under Pull Pumping Jack with Link Type Head.
10. Insert Type Roller Rod Line Carrier.
11. 90° Link Type Swing.
12. Knock-Off Post complete with Combination Clamps, Knock-Off Block and C Link.
13. Super Extra Heavy Gold Over.
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Exploration and Drilling

How Many Wells?

DURING the war drilling was controlled by government orders, and was based mainly on the factor of tons of steel necessary versus barrels of oil obtainable during the foreseeable war period, say 5 years. This was modified somewhat by considerations of proximity to established transportation facilities and points of military and essential civilian consumption. Basically, however, steel versus short-term oil yield was controlling.

Drilling in a free economy is based on a variety of considerations. There is, however, one basic factor that sums up all of the angles considered. That factor is the dollar return on the dollar investment over the productive life of the well.

It is worth taking a look at the peacetime trends as they appear at the present time, nearly 10 months after the war's end, to see what the collective decision of thousands of operators and engineers show. Their collective decision, made solely on a basis of their judgment of the dollar return on the investment, is a better guide to what trends are being established than any one person's opinion.

In 1938 the industry produced about 3,300,000 bbl. per day and drilled a little over 27,000 wells. In 1941, the last prewar year, daily production had been increased a half million, to 3,800,000 bbl., and a little over 32,000 wells were drilled.

In 1945, with war controls in effect for the major portion of the drilling campaign, production averaged about 4,700,000 bbl., an increase of 900,000 bbl. over 1941, and slightly fewer than 27,000 wells were drilled.

In 1946, in a free economy, albeit plagued by many shortages, the trend now looks like a production about the same for the year as in 1945, or 4,700,000 bbl. average, and drilling expected to account for a little under 30,000 wells. Compared to the last peacetime year, 1941, the trend seems to show an increase of 900,000 bbl. in production, or about 25 per cent, with 2,000 fewer wells, or about 8 per cent less.

This decision gives at least the surface appearance of a substantial trend toward fewer wells to maintain a larger production. There may be other possible interpretations, but by and large that seems to be the most reasonable.

It appears logical to assume that the war drilling orders only masked a prewar trend toward fewer wells for the same or larger sustained daily production. Whether this will continue in the future may be a subject for debate. One think is certain, the collective decision of thousands of operators and engineers will be the determining factor, and their judgment will reflect their opinion of the dollars-and-cents results that will be obtained.

EASTERN TEXAS

New Gas-Distillate Field Opened in Bowie County

DALLAS.—Barnsdall Oil Co. and Sohio Petroleum Corp. 1 Pickering, R. E. Sevey Survey, discovery 2½ miles southwest of Texarkana, Bowie County, after acidizing with 2,000 gal. in the Smackover lime from 7,030-85 ft., flowed 51 bbl. of 68°-gravity distillate in 24 hours through a 20/64-in. choke. Gas was gaged at 3,000,000 cu. ft. Tubing pressure was 1,350 ft. It has been shut in for official test.

Humble Oil & Refining Co. 1 Freeman, J. Little Survey, a Travis Peak wildcat 2 miles south and slightly east of Brushy Creek, Anderson County, was fishing for drill pipe at 12,686 ft. W. B. Hinton 1 Betts, A. S. Beard Survey, wildcat 4 miles southeast of Marietta, Cass County, was drilling below 6,722 ft. with no shows.

Phillips Petroleum Co. 1 Vannie, M. M. Long Survey, southwest offset to the discovery in the South Tyler pool of southern Smith County, will be given another squeeze job after making salt water from the Paluxy sand at 7,494-7,506 ft. It previously was reported dry in the discovery formation.

Hawkins field, Wood County, had three completions this week, New Hope field, Franklin County, and Pickton field, Hopkins County, had one each. Carthage field, Panola County, and Hawkins field each had three locations, and New Hope field and Sand Flat field, Smith County, each had one. Carthage field has 31 drilling wells; Hawkins field 21; New Hope field 7; Sand Flat field 5; Calvert field, Robertson County, and Merigale field, Wood County, each have 4.

EASTERN TEXAS SUCCESSFUL WILDCATS

Marion County: New oil pool—M. A. Freeman 1 L. Stevenson, J. Perry Sur., 2 mi. NW Jefferson, elev. 200 ft., pumped 165 bbl. day, perf. 6,495-6,507 ft., gravity 39.7°, gas-oil ratio 360 to 1, TD 7,230 ft.

Panola County: New oil pay—Skelly 1 S. E. Matthews, Wm. McFadden Sur., Carthage gas field, pumped 170 bbl. day, perf. 6,314-30 and 6,374-88 ft. Lower Pettit, gravity 49.3°, flowed 3,900,000 cu. ft. gas in Upper Pettit, TD 6,715 ft.

EASTERN TEXAS WILDCAT FAILURES

Cherokee County: Clark & Cowden Drlg. Corp. 1 Southern Pine Lbr. Co., N. Newton Sur. A-648, 7 mi. S and slightly W Rusk, elev. 424 ft., Woodbine 5,166 ft., dry, TD 5,190 ft.

Wood County: Union Prod. Co. (formerly Bridwell & Manziel) 1 C. R. Coker, Wm. Clark Sur. A-99, ¼ mi. N Crow, elev. 462 ft., Goodland 7,500 ft., Paluxy 7,590 ft., dry, TD 7,750 ft.

N. CENTRAL TEXAS

Knox County Prospect Shows Salt Water After Acidizing

WICHITA FALLS.—Cities Service Oil Co. 1 Doris Mulkey, Section 163, Block 44, H&TC Survey, Knox County wildcat 2 miles south of Truscott, which has been showing for an oil well through perforations from 6,222-40 ft., was treated with 1,000 gal. of acid and the hole filled with salt water. It is attempting to squeeze off the water. Before the acid treatment, it was swabbing oil at the rate of 5 bbl. per hour.

Grace & Grace 2 Edwards, Block 16, G. C. Bruner Survey, Abstract 8, Archer County wildcat 15 miles southwest of Wichita Falls, perforated casing from 5,520-40 ft. opposite the conglomerate pay and is testing. Test through first set of perforations from 5,250-80 ft. in the Caddo showed nothing. It was treated with 5,000 gal. of acid.

Sun Oil Co. and Standard of Texas 1 Midkiff-Davis, S. Gann Survey, deep test on the east side of the Sivell's Bend pool of northern Cooke County, is considered dry at 9,550 ft. after electrical survey was run. Although no markers have been announced, it was reported to have had no shows.

Electra field, Wichita County, had nine completions this week, Gatewood field, Cooke County, four, and Sunshine Hill field, Wichita County, two. Electra field had five locations, Gatewood field four, Wilson field Cooke County, three. Wilson field has nine drilling wells; National field, Wilbarger County, seven; Cooper field, Archer County, five, and Hull-Silk field, Archer County, and Hildreth and Nocona fields, Montague County, four each.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: Clyde Gibson Drlg. Co. 1 Luke McCrory, Tr., Blk. 67, ATNCL Sur., 2 mi. W and 1 mi. S Luke Wilson elev. 993, dry, 4,431 ft.

H. R. Theck 1 C. R. Seals, Blk. 144, Harris Subd., 3 mi. N and 1 mi. E Archer City, elev. 1,002 ft., dry, TD 1,482 ft.

Timberlake & Kelleher 1 L. F. Wilson, Lot 923, Blk. 85, ATNCL Sur., 1 mi. W and 8 mi. N Archer City, dry, TD 1,572 ft.

Timberlake & Kelleher 1 D. L. Wolfe, W.

Polk Sur., 7½ mi. E and 3½ mi. N Megargel, dry, TD 1,440 ft.

Clay County: Kadane & Sons 1 Frank Bunting, Sec. 2608, TE&L Sur., 1 mi. E and 3½ mi. N Antelope, elev. 1,114 ft., KMA 3,416 ft., dry, TD 3,689 ft.

Cooke County: Anderson Drlg. Co. 1 E. S. Ramsey, B. Lusk Sur. A-469, 2 mi. W and ½ mi. N Marysville, elev. 852 ft., Ellenburger 2,017 ft., dry, TD 2,235 ft.

H. W. Little 1 Ed Williams, Harriett Nail Sur. A-790, 2 mi. W and ½ mi. N Era, elev. 945 ft., Ellenburger 1,540 ft., dry, TD 1,585 ft.

Jack County: Hanlon-Buchanan et al 1 J. T. Patman, BBB&C Sur. A-101, 7 mi. E and 3½ mi. S Antelope, dry, TD 600 ft.

Young County: H. M. Kelleher 1 Nora Finch, Sec. 38, TE&L Sur., 2 mi. S and W Orth, dry, TD 868 ft.

R. S. Lesage 1 J. C. Farmer et al, W Compere Sur. A-1719, at Farmer, dry, TD 753 ft.

WEST CENTRAL TEXAS

ABILENE.—Roark & Hooker, Jones and Stasney 1 A. L. Sanders, Ellenburger extension well to the recent discovery, Allied Oil Co. 1 L. A. Sanders, 5 miles northeast of Albany, Shackelford County, is waiting on official test to be taken due to a bailer being lost in the bottom of the hole. Flowing through casing while cleaning, the well was gaged at 50 bbl. in 1 hour for the first hour, 60 bbl. the second hour and 80 bbl. during the third hour, making no water. Flow was from 4,541 ft., the total depth.

Lewis Steffins field, Jones County, and Shackelford County Regular field each had two completions this week. Lewis Steffins field had two locations and Shackelford County Regular field had one. Cisco field, Eastland County, has four drilling well; Reddin field, Taylor County, three; Silver Valley field, Coleman County, Palo Pinto County Regular field, Stephens County Regular field and Loving field, Stephens County, each have two.

WEST CENTRAL TEXAS SUCCESSFUL WILDCAT

Taylor County: New oil pool—West Central Drilling Co. 1 C. H. Murphree, Sec. 1, Blk. 9, SPRR Sur., 5 mi. S Merkel, elev. 1,889 ft., pumped 124 bbl. day through open 2-in. tubing, perf. 2,622-29 ft. Cook, gravity 42°, TD 3,060 ft.

WEST CENTRAL TEXAS WILDCAT FAILURE

Jones County: S. D. Johnson et al 1 Sears Est., Sec. 35, Blk. 18, T&P Sur., 2 mi. SW Noodle, elev. 1,880 ft., Noodle Creek 2,476 ft., dry, TD 2,494 ft.

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PERMIAN BASIN

Record Producer Completed In Block 31 Field

MIDLAND.—The Atlantic Refining Co. 1-B-31 University, Section 40, Block 31, University Lands, ½ mile south-southeast of the discovery of the Block 31 pool, Crane County, has been completed as the largest in the field with a combined daily flow of 2,011.80 bbl. of oil. It is the ninth producer. It flowed 1,670.82 bbl. of 44.9°-gravity oil in the Ellenburger from 10,305-450 ft. through a ¼-in. choke, following acid treatment of 1,000 gal. Gas-oil ratio was 615 to 1. Natural daily flow from the Devonian was 340.98 bbl. of 44°-gravity oil, with gas-oil ratio of 1,475 to 1. Production is from 8,460-8,825 ft.

Humble 1 Pio Crespi, Section 19, Block 38, T-2-S, T&P Survey, Devonian prospect a mile northwest of the Strawn discovery in the Midland pool of Midland County, was reacidized with 2,300 gal. through perforations from 11,420-450 ft. and 11,470-540 ft. It failed to flow when opened after a 12-hour shutin. Operator was swabbing.

Shell Oil Co., Inc., 1 Duke Wilson, Section 38, Block 14, TWNG Survey, southeastern Sutton County wildcat, 19 miles southeast of Sonora and 28 miles south of the Page field in Schleicher County, has been completed for 9,270,000 cu. ft. of gas daily. Production is from 4,220-45 ft. in the Strawn. Argo Oil Co. 1 Dora Roberts, Reeves County wildcat 13 miles northeast of Balmorrhea, was drilling below 11,050 ft. in sand and shale with no shows reported.

Dave Bennett of Chicago and J. W. Sorrells of Chicago and Abilene will drill an 8,000-ft. wildcat 11 miles northwest of San Angelo in Tom Green County. It is 1 Sanders, 330 ft. out of the northwest corner of Section 186, Washington County Ry. Co. Survey, 2 miles northwest of the Grape Creek school.

Shell Oil Co. 1 A. Nelson, Section 8, Block A-40, Public School Lands, Andrews County, Ellenburger discovery near the New Mexico line, attempted a drill-stem test to the total depth, 10,606 ft., in granite wash, but the packer did not hold. The tool was in the hole 45 minutes but there was no recovery. The granite wash was entered at 10,585 ft., 7,250 ft. below sea level.

Block 31 pool, Crane County, Fort Stockton pool, Pecos County, and Sharon Ridge pool, Scurry County, each had two completions this week. North Ward Estes pool, Ward County, and Keystone-Holt pool, Winkler County, each had three locations. McElroy pool, Crane County, and Penwell pool, Ector County, each had two. TXL field, Ector County, has 40 drilling wells; Keystone-Ellenburger field, Winkler County, 26; Fullerton field, Andrews County, 25; Welch field, Dawson, 17; Todd Deep field, Crockett County, and Martin field, Andrews County, each 8.

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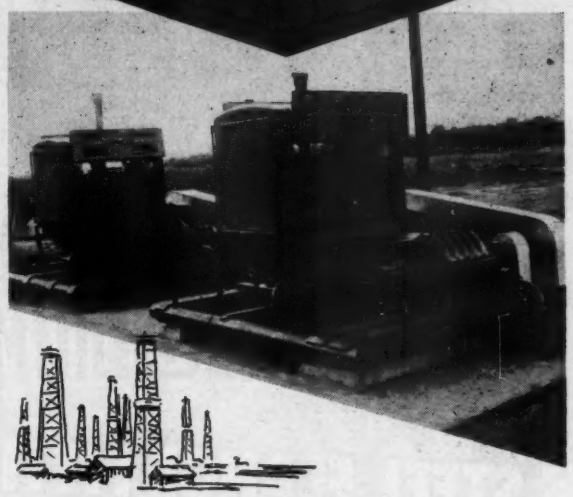

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WEST TEXAS WILDCAT FAILURES

Crockett County: Geo. D. Morgan, Tr., 1 J. S. Todd, Sec. 55, Blk. UV, GC&SF Sur., 2 mi. E of S end of Todd Deep field, elev. 2,530 ft., dry, TD 1,525 ft.

Dawson County: Ray A. Albaugh 1 J. T. Middleton, Sec. 69, Blk. 8, ELRR Sur., 1 mi. W O'Donnell, elev. 3,036 ft., San Andres 3,980 ft., dry, TD 5,014 ft.

Swisher County: L. A. Helms et al Mrs. W. C. Watson, Sec. 125, Blk. M-10, BS&F Sur., elev. 3,400 ft., dry, TD 3,540 ft.

Tom Green County: Harley Sadler 3-8 Bob Mims, Sec. 80, Blk. 6, H&TC Sur., 3½ mi. SW Funk pool, elev. 2,262 ft., dry, TD 1,440 ft.

PANHANDLE WILDCAT FAILURE

Hartley County: Shamrock Oil & Gas 1 Reed, Sec. 169, Blk. 44, H&TC Sur., 7 mi. NE Channing, elev. 3,866 ft., dry, TD 4,090 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Boller & Rutledge 1 Iles, 10-17s-32e, has assured flowing production for the undeveloped area between the West Robers and Maljamar fields in west central Lea County. The discovery flowed 50 bbl. of oil in 2 hours through open 2-in. tubing. Pay was topped at 3,967 ft. When drilling had reached 3,974 ft., the well flowed naturally 256 bbl. of oil in 24 hours. The well is 2 miles west of the West Roberts pool and approximately the same distance north of the nearest production in the Maljamar pool. Testing will continue.

Repollo Oil Co. 4 Brunson, 4-22s-37e, ¼ mile north of production in the Brunson (Ellenburger) field, Lea County, was completed for a natural daily flow of 952 bbl. of 42°-gravity oil. Production is through casing perforations from 7,735-7,830 ft. It is the seventh producer for the field.

Brunson field, Lea County, had one completion this week. Artesia field, Eddy County, and Drinkard and Lovington fields, Lea County, each had one location. Caprock field, Lea and Chaves counties, has 23 drilling wells; Drinkard field 16; Grayburg-Jackson and Square Lake fields, Eddy County 12; Paddock field, Lea County, 6, and Empire field, Eddy County, and West Roberts field, Lea County, 4 each.

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SOUTH LOUISIANA

Chacahoula Field, Lafourche Parish, Gets Good Well

NEW ORLEANS.—Sun Oil Co. has added a good well to the Chacahoula field of Lafourche Parish. The 30 Dibert-Brown, 36-15s-15e, made a potential flow of 178 bbl. of 33°-gravity oil daily through a ⅛-in. choke with 1,150 lb. flowing pressure on the tubing. Total depth is 7,828 ft., with 7-in. casing cemented to 7,800 ft. Production is through 100 perforations at 7,658-84 ft.

Sun and Sohio Petroleum Co. 2-A J. R. Dailey has been completed in the 9,800-ft. pay horizon of Egan field, Acadia Parish, after showing gas and condensate in the 10,100-ft. pay. Pipe was perforated with 16 shots from 9,910-14 ft. for an initial production gage of 272 bbl. of 46°-gravity oil daily through a ¼-in. choke with 2,825 lb. flowing pressure on the tubing and a ratio of 12,580 to 1. It is showing 0.8 per cent basic sediment water cut.

Union Oil Co. of California started five new explorations in the South Louisiana district. Of the five, two are wildcats, and three are field ventures. In the Bay Marchand area of Lafourche Parish, the company started 1 City of New Orleans which is a scheduled 12,000-ft. venture in 24-23s-22e. It is at a total depth of 2,918 ft. drilling plug from 10¾-in. surface casing cemented at 2,885 ft. In the Houma discovery area just east of Houma townsite in Terrebonne Parish, the company is rigged up and ready to start drilling its 1 R. R. Barrow, Inc., approximately ½ mile southeast of present gas and condensate production, being in 1-17s-18e. The three field ventures are 5-A State, Lease 540 at West White Lake in Vermilion Parish, and two in the Vinton field, 39-G Matilda Gray, which is drilling below 650 ft. in shale, and the 2-X Union-Wynne Unit, a twin test.

The British American Oil Producing Co. has been granted a permit to drill 1 A. M. Dupont Corp. as a wildcat test in the Lapeyrouse area of Terrebonne Parish. Test is located in 15-20s-18e, and is to be drilled to 12,000 ft.

The eight new locations reported included two wildcats, one each in Cameron and Terrebonne parishes. Three new oil sands were opened this week, one each in Egan field, Acadia Parish, Bayou La Fleur field in Plaquemines Parish, and Port Barre field, St. Landry Parish. There were 11 field completions, 4 producers and 7 dry holes.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Acadia Parish: New oil sand, Egan field—Sun-Sohio 3 E. M. Regan, 31-9s-1w, TD 13,500 ft., top sand 11,874 ft., perf. 96 holes 11,874-906 ft., PT 390 bbl. 24 hours through a 10/64-in. choke, gas-oil ratio 7,564 to 1, TP 6,100 lb., gravity 52°, 50 per cent water.

Plaquemines Parish: New oil sand, Bayou La Fleur field—The California Co. 2 E. P. Brady et al, 34-16s-24e, TD 10,501 ft., top sand 10,445 ft., perf. 30 holes 10,485-90 ft., PT 260 bbl. 24 hours through 9/64-in. choke, gas-oil ratio 1,280 to 1, TP 2,000 lb., gravity 36°, 0.1 per cent water.

St. Landry Parish: New oil sand, Port Barre

field—Pan American Prod. Co. 17 H. L. Garland, 4-6s-5e, TD 9,299 ft., top oil sand 9,169-91 ft., perf. 150 holes 9,166-91 ft., PT 381 bbl. in 24 hours through a 10/64-in. choke, gas-oil ratio 1,050 to 1, TP 1,750 lb., gravity 37°, no water.

ROCKY MOUNTAIN

Development of Deep Zones Under Way at Cut Bank

DENVER.—An interesting picture is developing in the area of the Cut Bank field in northern Montana where exploration of formations below present producing horizons has been under way for several months following a discovery in the top of the Madison in Carter Oil Co. 1 Brindley, C NE NE 12-36n-6w, last fall. This well had water in the Cut Bank sand at 2,882-2,942 ft., but resulted in a discovery in the top of the Madison at 3,084 ft., swabbing 122 bbl. of 37°-gravity crude in 21 hours at a total depth of 3,087 ft. The elevation is 3,784 ft., and the top of the Ellis was at 2,942 ft. This test was drilled partly as the result of oil being found some time previous in the Ellis-Madison contact in the Reagan area 10 miles to the northwest.

Following the Brindley discovery, Carter drilled 1 Larmon, a south offset in C SE NE of Section 12. It had the Madison at 3,046 ft. and was completed at 3,073 ft., flowing 70 bbl. in 24 hours through a ¼-in. choke, the production varying on several 24-hour tests, along with gas, the highest test showing 465,000 cu. ft. in 24 hours. Final completion figures were 11 bbl. of oil and 200,000 cu. ft. of gas. An east offset then was drilled in 1 Merchants Trust, C NW NW 7-36n-5w. It was completed at 3,071 ft., with the top of the Madison at 3,039 ft., flowing on initial test 4 bbl. of oil and 100,000 cu. ft. of gas in 24 hours through a ½-in. choke.

In the meantime Union Oil Co. drilled 4 Langenbeer in NW NE NW 18-35n-5w, 7 miles south of the Brindley discovery, to 3,130 ft., with the top of the Madison at 3,065 ft. It had traces of oil with water at 3,110-18 ft., and was plugged back to 2,940 ft. and is standing. Union then went 3 miles to the east and drilled 3 Thomas Unit, in C NW SW 11-35-5w, topped the Madison at 2,832 ft., encountered a show of gas at 2,880 ft., followed by sulfur water, and was abandoned at 2,902 ft. Pardee-Inland Empire Refining 1 McAlpine, SE SE NW 11-37n-5w, 7 miles northeast of the Brindley discovery, topped the Madison at 2,972 ft., encountered water and was abandoned at 2,987 ft. The above mentioned wells all stopped just below the Ellis-Madison contact.

Union Oil Co. next drilled 1 Stufft, C SW NW 19-36-5w, situated 2¼ miles south of the Brindley discovery. This well was completed at 3,097 ft., approximately 90 ft. in the lime, and had 700 ft. of fluid in the hole, making approximately 30 bbl. per day on the pump. However, after acidizing with 1,500 gal., it began flowing at the rate of 200 bbl. per day from a break in the lime. This was the first of the series drilled into the lime and to be rewarded with a producer in a break. Following this development, Carter has gone back into 1 Larmon to drill it deeper. At 3,809 ft., it ran tubing and swabbed fluid 900 ft. from the bottom. The swab was run every 45 minutes and swabbed ¾ bbl. of oil per hour for 6 hours. The well then was killed to drill deeper. The net results to date are favorable indications for the developing of a new pay in the top of the Madison with encouraging prospects in breaks in the lime at deeper levels over a considerable area.

River Dome well.—Pure Oil Co. 1 Unit, NE NE NW 18-48n-92w, River Dome discovery in the Embar, succeeded in pulling the tubing, set packer at 9,950 ft., and will hang the 5-in. at 3,500 ft. preliminary to acidizing and testing. Analyses show gas has hy-

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drogen-sulfide content of 29 per cent or 2.65 lb. of sulfur per 1,000 cu. ft. of gas. The sulfur content of the oil is 1.1 per cent by volume. The gravity is 42.7 degrees. No. 2 Unit 1½ miles to the northwest, topped the red beds at 9,310 ft.

Rangely outposts.—Continental Oil Co. 2 Rooth C SW SW 15-2n-103w, west side outpost, Rangely field, which encountered a heavy flow of gas spraying 36 degrees gravity crude in a stray sand in the red beds at 6,100 ft., has killed the well and is reaming to set an intermediate string at 4,500 ft. Cobb-Stringer-Newton 1-D Government C SE SE 4-1n-102w, southern outpost which cored 24 ft. of saturated sand in an unidentified horizon at 6,835-59 ft., failed to get a satisfactory drill-stem test and will try again. It will not be drilled any deeper. Total depth, 6,859 ft.

New operations.—There were 24 new operations reported, of which 6 were in Colorado, 7 in Wyoming, and 11 in Montana. All are development wells with the exception of a shallow wildcat in Meagher County. The Colorado locations all were in the Rangely field. Wyoming included two locations in Big Hollow, Albany County, and one each in Byron, Rock River, Allen Lake, Lance Creek and East Lance Creek. Montana locations included four in Kevin-Sunburst, two in Bowdoin, two in Cat Creek and one each in Meagher County, Whitlash field in Liberty County, and in Cut Bank.

Completions.—Fourteen wells were completed, of which 8 were oil wells with initial production of 1,185 bbl., 3 were gas wells and 3 were dry holes. Colorado had one completion for 250 bbl. in 14 hours in the Wilson Creek field. Wyoming had 3 oil wells for 590 bbl. and 1 gas well in South Elk Basin for 13,818,000 cu. ft. Montana had 4 oil wells completed for 345 bbl., of which 1 was in Cat Creek and 3 in Cut Bank, 2 small gas wells in Bowdoin and Kevin Sunburst and 3 dry holes in Kevin Sunburst.

MONTANA SUCCESSFUL WILDCATS

Cut Bank, Glacier County: Union Oil Co. 1 Stufft, C SW NW 19-36-5w, TD 3,097 ft., 90 ft. in Madison lime, 30 bbl. per day on pump, acidized with 1,500 gal., flowed at rate of 200 bbl. per day.

Cat Creek, Petroleum County: Wm. Hanlon 1 N. Pacific, NE NE SE 1-14n-30e, TD 1,829 ft., Ellis, 1,799 ft., swabbed 75 bbl. fluid per day, two-thirds water, will put on pump. First Cat Creek sand 1,180 ft., second sand 1,380 ft.; third sand 1,490 ft.

MONTANA WILDCAT FAILURE

Cat Creek, Petroleum County: A. B. Cobb & Co. 1 Northern Pacific, NE NE SE 27-15n-30e, TD 3,572 ft., no shows, plugged and abandoned, first Cat Creek 1,005 ft., Ellis 1,630 ft., Amsden 2,040 ft., Kibby 3,150 ft.

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TEXAS GULF COAST

New Gas Pool Discovered In Fairbanks Area

HOUSTON.—A new gas pool for the Fairbanks area of Harris County has been opend by Dick Schwab and Jack W. Frazier 1 O. H. Caldwell, in A. G. Holland Survey, 3 miles south of the townsite of Fairbanks and about 2 miles from production in the Fairbanks pool. The test flowed dry gas with 1,100 lb. pressure on tubing through a ¼-in. choke through perforations at 8,302-8,320 ft. This well flowed gas-condensate and salt water with 2,300 lb. pressure through perforations at 7,895-7,900 ft. on previous test but these perforations were squeezed. Total depth is 8,475 ft. and 5½-in. casing is cemented to 8,343 ft.

Hewit & Dougherty 1 A. A. Johnson is a new gas pool opener in Jackson County, 3½ miles northwest of Cordele field and 10 miles north of Edna, in Wm. Whitaker Survey, Abst. 79. On a 5/32-in. choke, the well flowed gas through perforations at 4,156-60 ft. No gage was made and well was shut in, tubing pressure 1,680 lb., and casing pressure 1,725 lb. Total depth is 4,760 ft. with 5½-in. casing set to 4,215 ft.

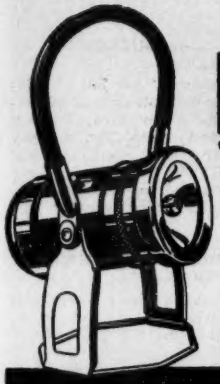
West Production Co.-Noranda Oil Co. 1 Boring, in Amy Boatwright Survey, Madison County, wildcat 7 miles southwest of the townsite of Madisonville, indicated production in the lower Cretaceous formation when it flowed gas with a strong sulfur odor on drill-stem test through perforations at 11,815-865 ft., with maximum flowing pressure of 2,300 lb. When tool was closed the well developed 3,200 lb. pressure on a ½-in. choke. While pulling tool the well attempted to blow out, but it was controlled. This test is the second in the Upper Coast area to show for production in the lower Cretaceous formation. First was the Magnolia Petroleum Co. 2 E. R. Bolton, Henry Bond League, in Trinity County, about 38 miles east of the 1 Boring, which was completed as a condensate producer from the Fredericks lime from 10,500-540 ft.

John W. Mecom 1-B Cade, in C. T. Cade Survey, will endeavor to extend production in the High Island pool of Galveston County to the southeast into Chambers County. This new test is 280 ft. south of the south line of Lot 14 and 283 ft. east of the east line of Lot 15, of the Cade subdivision. It is contracted to 7,500 ft. Rig is being moved onto location for immediate operations.

Fourteen new locations were reported with two being wildcats, one each in Chambers and Wharton counties. A new oil sand was opened in Cedar Point field, Chambers County. Four dry wildcats were completed, one each in Chambers, Jackson, Montgomery, and Wharton counties. Brazoria, Chambers, Hardin, and Harris counties each received two completions.

UPPER GULF COAST TEXAS SUCCESSFUL WILDCAT

Chambers County: New oil pay, Cedar Point field—Standard Oil Co. of Texas 3-M



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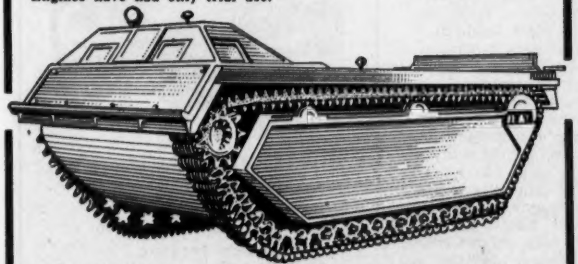

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UPPER GULF COAST WILDCAT FAILURES

Chambers County: Jack W. Frazier 1 Geo. F. Wilburn Estate, Jackson Pasture area, T&NO Survey, Abst. 254, 2½ mi. SE of Jackson Pasture field, dry, TD 9,022 ft.

Jackson County: R. N. Ranger 1 J. H. Tucker Estate, John York Survey, 1½ mi. SW of Edna, dry, TD 6,512 ft.

Montgomery County: E. H. Stafford 1 Fraser-Campbell, in Chas. B. Gohlson Subdn. of J. M. de la Garza Survey, 7 mi. NE Willis, dry, TD 5,038 ft.

Wharton County: J. Hornberger et al 1 Gilbert J. Hafernik, BBB&C Survey, 3½ mi. W El Campo, dry, TD 5,020 ft.

SOUTHWEST TEXAS

Second Gas Sand Found In Sliva Field

CORPUS CHRISTI—A new gas pay sand for the Sliva field in Bee County is being opened by Bridwell Oil Co. 1 Jake Huble Estate. Drilled to a depth of 4,500 ft., the test was plugged back to the 3,400-ft. Frio gas sand for completion. A drill-stem test at 3,968-92 ft. in the Vicksburg zone recovered 360 ft. of oily salt water, 285 lb. working pressure, tool open 15 minutes. Electrical log was run to total depth with no shows indicated in the 4,400-ft. Still-well discovery pay sand. This well is located in the Brooks and Burleson Survey, Abstract 497, 3,850 ft. southwest of the 1 Sliva oil discovery and 2,200 ft. southeast of the 1 Baird, gas well.

Humble Oil & Refining Co. 1 Mrs. Kate Bradshaw, discovery oil well in the Carrizo Park area, southwest of Carrizo Springs, in Lot 7, T&NO Survey 15, Dimmit County, was gaged at 27 bbl. per day through a ¼-in. choke, with 55 lb. tubing pressure, and 16 per cent basic sediment still in the flow, on initial test through perforations at 2,795-2,807 ft. Total depth is 2,965 ft. and 5½-in. casing is set to 2,875 ft.

Humble 2 Skipper, at Rachal field, Brooks County, an old dry hole, is reported to have blown out and flowed gas and salt water. Total depth is 8,001 ft. It is located in La Encantada Grant, 1½ miles northwest of Rachal.

Continental Oil Co. 1-B Albert West, 4½ miles northwest of George West and 5,615 ft. southeast of the 2-A Albert West discovery oil well at Albert West field, in J. Jamieson Survey 166, Live Oak County, flowed 5 bbl. of 31°-gravity oil in 18 hours with a little wash water through a ½-in. top choke. The test was through perforations at 6,787-90 ft. in the bottom of the Slick sand. Operators are still testing for completion. Total depth is 7,750 ft. with 6-in casing on bottom. Slick sand was logged showing gas at 6,747-85 ft. with oil-gas contact at 6,785 ft. and oil-water contact at 6,796 ft. The Luling sand was logged at 6,937-74 ft. showing gas, with oil-gas contact at 6,974 ft. and oil-water contact at 6,984 ft. The Massive Wilcox sand showed gas at 7,305-40 ft. with salt water below.

Nineteen new locations were reported this week with seven being wildcats, two each in Starr and Webb counties and one each in Karnes, Milam, and Travis counties. One successful exploratory test was completed in Starr County, while 11 were dry holes, 2 each in McMullen and Webb counties, and 1 each in Duval, Karnes, Live Oak, Milam, Starr, Victoria, and Zapata counties. Refugio County received the greatest activity with four producers reported. Starr, Webb, McMullen, and Willacy counties received three completions each.

SOUTHWEST TEXAS SUCCESSFUL WILDCAT

Starr County: Extension to old field—George H. Echols 2 M. M. Garcia, Boyle-Rincon fields extension area, Porcion 90, 14 mi. NE Rio Grande City, top pay 3,394 ft. Frio, TD 4,106 ft. Perf. 48 holes 3,394-3,402 ft., PT 20 bbl. oil per day through ¼-in. choke, gas-oil ratio low, TP 120 lb., casing sealed, gravity 42°, no water.

WILDCAT FAILURES IN SOUTHWEST TEXAS

Duval County: Skinner & Eddy Corp. and Newman Bros. Drlg. Co. 1 Welder, M. A. Andrews Sur. 24, 16 mi. SW SAN Diego, dry, TD 4,010 ft.

Karnes County: Seaboard Oil Co. 1 Paul Banduch, A. Hermandez Sur., Abst. 4, 1½ mi. NW Panna Maria, dry, TD 4,342 ft.

Live Oak County: Dirks Bros. and Slick Oil Co. 1 Mrs. J. L. Rentfro, BS&F Sur. 2, dry, TD 3,458 ft.

McMullen County: Harry Ezzell 1-A Harry Ezzell, S. B. Turner Sur. 8, 14 mi. SE Tilden, dry, TD 1,937 ft.

Brown & Brown 1 Wm. Hubbard, Michael Nell Sur. 85, dry, TD 1,275 ft.

Milam County: Production Serv. Co. 1 Richard Ellison et al, L. Taylor Sur., 1 mi. N Baileyville, dry, TD 3,206 ft.

Starr County: Tarver & Staggs 1 Antioco Munoz, El Javali Grant, 40 mi. NW Rio Grande City, dry, TD 2,380 ft.

Victoria County: Barnsdall Oil 10 Union-Keeran, Martin de Leon Grant, 5 mi. SW West Ranch field, dry, TD 8,150 ft.

Webb County: Dulaney Oil Co. 1 State of Texas-Survey 838, 15 mi. S Mirando City, 1 mi. SW Aviator field, dry, TD 2,004 ft. Bad cement job, hole junked.

Webb County: Long Bros. Drlg. Co. 1 E.

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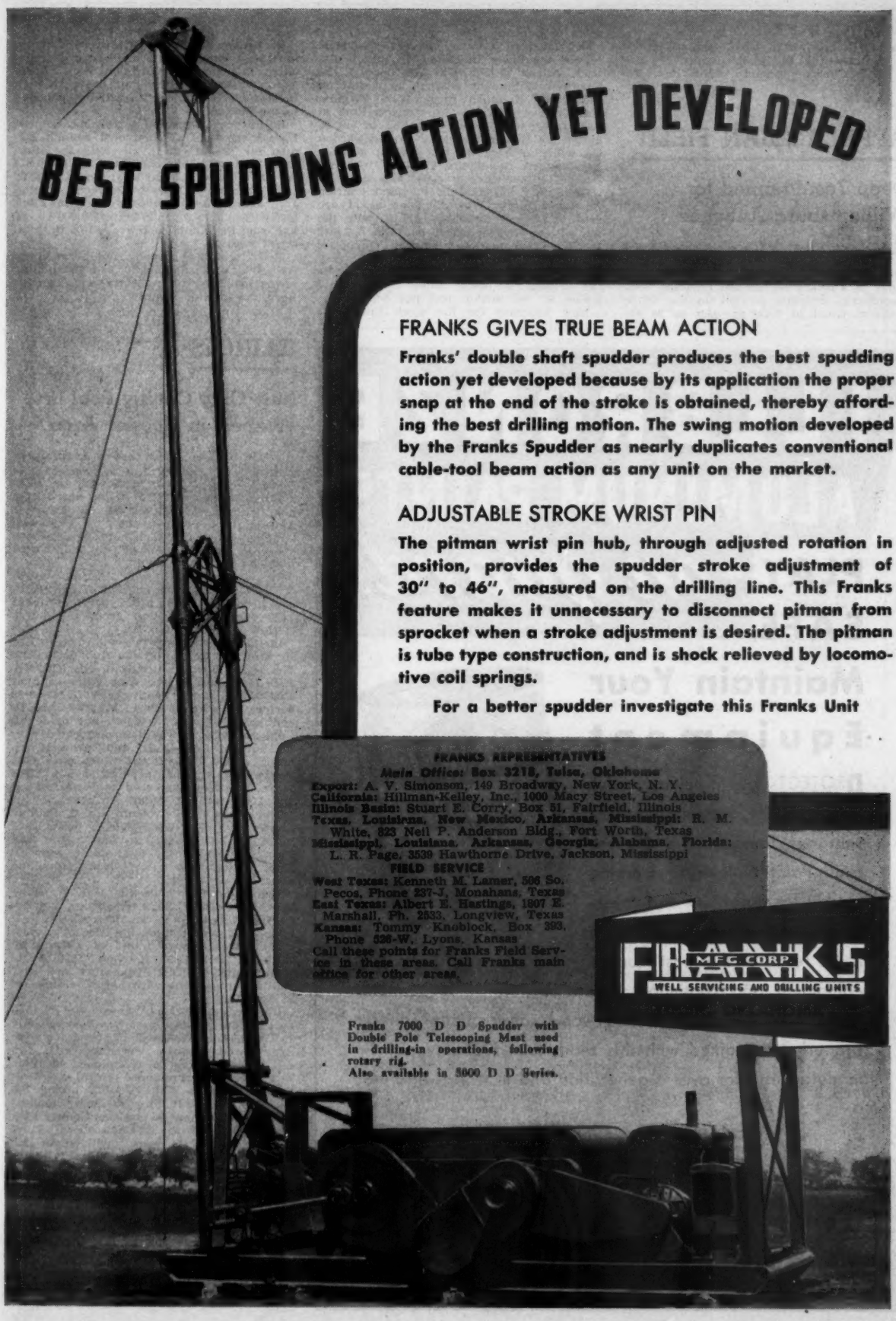
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Leal, Survey 671, 11½ mi. N Bruni, dry, TD 1,813 ft.

Zapata County: J. O. Moss 1 Amelia O. de Vella et al, El Grullo Grant, 1¾ mi. NW Charco Redondo field, dry, TD 1,510 ft.

APPALACHIAN FIELD

Deep Test Planned for Williamsburg Anticline

PITTSBURGH.—A new deep test is starting in Williamsburg district, Greenbrier County, West Virginia. The Texas Co. will move in a rotary on the Mt. Pleasant (Williamsburg) anticline located on the White Sulphur Quad at 2,600 ft. east of 80 degrees 30 minutes, 8,800 ft. north of 37 degrees 55 minutes.

In Jackson County, several wildcats topped the lower Devonian. In Ripley district, Aileen Oil & Gas Co. topped the Corniferous lime at 4,889 ft. in a test on the Perry Hickman farm. West Virginia Gas Corp. topped the Corniferous lime at 4,839 ft. from a surface elevation of 718 ft. at the 534 Howard Hopkins. United Carbon Co. will plug back the test 1,339 L. M. Parsons, which found the Oriskany (4,924-60 ft.) dry to the Brown shale, and shoot.

On Briery anticline in Portland district, Preston County, Wm. E. Snee et al are drilling 3 Harry Sisler at 4,117 ft. with the top of the Brown shale at 3,632 ft. and the present formation very dark. On upper Devonian markers, it appears running very much higher than either No. 1 or 2. Gas for drilling is being taken from No. 2 which is still unshot and not acidized.

New locations for the week totaled 23 and were scattered through several counties.

In Beaver Township, Crawford County, northwest Pennsylvania, the test of Appalachian Development Corp. on W. J. Bittle farm, which has been shut down through the Onondaga at 2,401 ft., will be deepened to the Medina.

In Bethel Township, Armstrong County, Daniel Schall et al completed 2 John Iseman for 720,000 cu. ft. gas with the Hundred Foot sand topped at 1,600 ft.; gas 1,614 ft.; gas 1,630-38 ft., and total depth 1,638 ft.

In Washington Township, Greene County, J. C. Johnson et al completed the Hal Funk test with a final open flow of 771,000 cu. ft. gas from the Gantz sand at 2,801-05 ft., total depth 2,806 ft.

New locations totaled five situated in Bethel, Cowanshannock, and Mahoning townships, Armstrong County, and Twilight Boro, Washington County.

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ILLINOIS

New Clay County Pool in Prospect in Hoosier Area

MATTOON.—A new pool is in prospect about 1 mile south of the Hoosier pool in Clay County where N. V. Duncan et al 1 Wilkins, NE NE SE 11-4n-7e, has drilled plug with casing set on the McClosky at 2,948-53 ft., total depth 3,003 ft. This well swabbed 3 bbl. of oil an hour natural, and operators are now preparing to acidize with 3,000 gal.

The Hoosier pool, which is due north of the 1 Wilkins, now consists of two wells, one producing from the Cypress at about 2,550 ft. and the other from the lower O'Hara at about 2,900 ft.

In Hamilton County two wildcat tests are showing prospects of making producers. The H. H. Weinert Leo Hall, NE NW NW 29-3s-7e, is testing the Aux Vases sand at 3,238-57 ft., total depth 3,499 ft. It was perforated with 48 shots at 3,398-3,414 ft. and acidized with 1,000 gal. but made no fluid recovery. It was then perforated with 50 shots at 3,325-42 ft. and made 1 bbl. of oil and 1 bbl. of salt water per hour. Following additional perforations at 3,246-56 ft., recovery increased to 5 bbl. of oil and 1 bbl. of salt water per hour.

The Magnolia Petroleum Co. 1 Pauline Rohrer, NW NE SW 23-4s-7e, is now cleaning out following a 30-qt. shot in the Aux Vases at 3,276-86 ft., total depth 3,290 ft. Prior to shooting it made 1 bbl. of oil an hour.

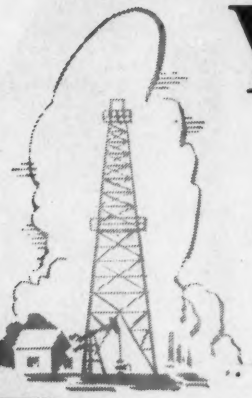
The Sohio Petroleum Co. 1 R. W. Hawkins, SE SE NW 29-1n-4e, Marion County, has recovered 150 ft. of clean oil on a 1-hour drill-stem test of the McClosky. McClosky breaks were found at 2,877-79 ft., 2,881-83 ft., 2,884-86 ft., and 2,906-10 ft., total depth 2,930 ft. Operators are now waiting on cement with 5½-in. casing set at 2,865 ft.

Illinois completions showed a decided decline during the past week with only 29 completions reported, of which 10 were dry. Three wildcats were reported, two dry holes and one an abandoned location. New operations announced during this week totaled 46, with White County taking the lead for the first time in many months with 15 of the new tests. Coles County took second place with six new tests. Eight new wildcat tests were included in the first reports, three being in Edwards County, two in Washington, and one each in Fayette, Effingham, and Marion counties.

ILLINOIS WILDCAT FAILURES

Cumberland County: National Associated Pet. Corp. 1 C. S. Young, NW NW SW 4-10n-7e, dry at 2,250 ft., Glen Dean 1,791 ft., Barlow 1,880 ft., Cypress sand 1,908 ft., Benoist 2,014 ft., Aux Vases sand 2,072 ft., Ste. Genevieve 2,116 ft., Rosiclare 2,130 ft., Fredonia 2,155 ft.

What're Your Plans?



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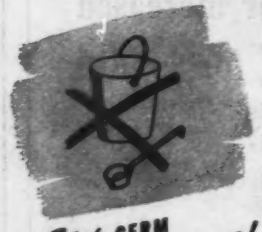

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Jasper County: C. J. Simpson 1 Bayles, NW SE NE 36-7n-9e, location abandoned.

Marion County: Paul Doran 1 Betts, NE NE SE 4-4n-1e, dry at 1,890 ft., Glen Dean 1,302 ft., Golconda 1,355 ft., Cypress sand 1,477 ft., Paint Creek 1,532 ft., Benoist sand 1,590 ft., Renault 1,670 ft., Aux Vases sand 1,634 ft., Ste. Genevieve 1,719 ft., Rosiclare 1,750 ft., Fredonia 1,790 ft., McClosky 1,802 ft.

CANADIAN FIELDS

Taber Field Well Has Good Flow on Initial Test

CHATHAM.—In the Taber field, southern Alberta, Taber-Province 65-15-A, LSD 11, 15-9-17w4, joint test by California-Standard and Nassau Exploration on a 24-hour initial test through ¼-in. choke produced 250 bbl. of 23.7°-gravity clean crude with no salt water. Held to a 12/64-in. choke with less than 550 cu. ft. gas-oil ratio it has settled to 150 bbl.

Steveville.—In the Steveville - Princess field, eastern Alberta, Princess-C.P.R. 12-22-A, LSD 1, 22-20-12w4, after testing the Sunburst sand is deepening below 3,349 ft. to test the Madison and Devonian limestones. In the same field a group of companies, headed by California-Standard, and including Pacific Petroleums, Princess Petroleums, Globe Oil, Empire Petroleums, Homestead Oil and Pacalta Oil have arranged for a series of four tests on 5,040 acres checkerboarded over Townships 17 to 19, Ranges 11 and 12, south of the field. The first well, South Princess Syndicate 1, LSD 9, 28-19-12w4, southwest of the National-Empire well, will test formations down to the Madison.

Provost.—The first test of a new plains area in Central Alberta has been undertaken by Imperial Oil which recently spudded Imperial-Provost 1, LSD 3, 27-37-3w4. Location, about 10 miles south of Provost, is in the center of a 34,192-acre reservation extending from south of Buffalo Park and Wainwright to Consort and Monitor.

Crossfield.—Imperial - Anglo Canadian 1, LSD 9, 11-28-2w5, in the Crossfield area near Calgary, has been abandoned at 9,526 ft. Both the Madison and Devonian formations showed water. Casing was perforated over about 1,000 ft. above the lime and a shot of 120 quarts used, a 100-ft. sand yielding 835,000 cu. ft. gas with about 2 bbl. oil. The formation, equivalent to the Dalhousie sand of Turner Valley, was water free.

Keho Lake.—In the Keho Lake district, southern Alberta, Okalta Oils of Calgary has spotted its first test in LSD 1, 16-11-22w4, less than a mile east of Hudson's Bay-Marland 1, which got near-commercial oil production in a stray sand of the Benton formation. The new well is the first of a series of tests on holdings of 10,158 acres.

Edmonton.—A reservation on 312,000 acres in the Ponoka and Wetaskiwin areas of Alberta south and southwest of Edmonton has been taken up by McColl-Frontenac Oil Co. Except for a little shallow drilling many years ago, the area is practically untested.

Kinsella.—In the Kinsella field, three more wells are testing production. Imperial-Kinsella 10, LSD 10, 29-49-13w4, finished at 2,211 ft., and Imperial-Kinsella 13, LSD 10, 15-46-10w4, is testing at 2,157 ft. Northwest Utilities 21, LSD 6, 13-48-12w4, has finished drilling at 2,272 ft. Two new tests are rigging.

Lloydminister.—In the Alberta end of the Lloydminster field, Marina 3, LSD 9, 27-49-1w4, has been completed at 1,919 ft. with 7-in. casing cemented at 1,900 ft. and is testing. In the Saskatchewan end of the field, Community Services 13, LSD 4, 11-29-28w3, finished at 1,886 ft., started as a

flowing well with initial production 75 bbl. or better. Community Services 12, rated at 130 bbl. and 9, rated at 80 bbl., are both in the same LSD. Production from the field is trucked to the Excelsior Refineries west of Lloydminster for processing for railway fuel.

MICHIGAN

Thumb District May Have First Good Oil Discovery

SAGINAW.—What appears to be the first sizable oil discovery in Michigan's Thumb district is reported by Gordon Oil Co. as the result of a test on a lease owned by Shell Oil Co., which explored the Thumb for about two years, discontinuing most activities in the area about a year ago. Other field operations for the week resulted in 21 completions for 5 oil wells, 5 gas producers and 11 dry holes, 7 of which were wildcat tests; 15 new locations were announced.

The Thumb wildcat producer, which Gordon Oil says is good for 100 bbl. a day, is in Section 31 of Elkland Township, Tuscola County. Depth is 2,698 ft. The oil was reported to be of a grade similar to that from Bay County's Essexville field.

Eight of the week's completions were wildcat tests, one in Rolland Township, Isabella County, coming in as a gas well for 2,500,000 cu. ft. a day. Failures included a Pure Oil Co. deep test in Rubicon Township, Huron County, discontinued at 5,703 ft.

New locations: three in Allegan County, three in Mecosta, two each in Arenac and Isabella; one each in Newaygo, Ogemaw, Calhoun, Van Buren and Kent.

MICHIGAN SUCCESSFUL WILDCAT

Isabella County, Rolland Township: West Michigan Consumers Co. 1 Clarence Lake, SE NW NE 30-13n-6w, gas well, 2,500,000 cu. ft. per day, TD 1,337 ft.

MICHIGAN WILDCAT FAILURES

Huron County, Rubicon Township: Pure Oil Co. 1 Joseph Stapleton, C N½ NW SW 22-17n-15e, dry, TD 5,703 ft.

Clinton County, Lebanon Township: Carter Oil Co. 1 C. H. Kirkham, NW SW NE 32-8n-4w, dry in Dundee, TD 2,995 ft.

Kent County, Tyrone Township: Fisher-McCall Oil & Gas Co. Neil Wagenaar 1 John N. Coalter, SW SW NW 15-10n-12w, dry in Traverse lime, TD 2,353 ft.

Midland County, Edenville Township: Sun Oil Co. 1 Mary G. Walker et al, SW SW SW 11-10n-1w, dry, TD 4,024 ft.

Missaukee County, Caldwell Township: Gordon Oil Co. A-1 State-Caldwell, NE NE SE 31-23n-8w, dry in Marshall, TD 1,478 ft.

Montcalm County, Evergreen Township: Union Drilling & Producing Co. 1 E. H. Robinson, SE SW NE 16-10n-6w, dry in Dundee, TD 3,363 ft.

Maple Valley Township: West Michigan Consumers Co. 1 Dennis Robinson, communitized, NE NE SW 28-11n-9w, dry, TD 1,166 ft.

KANSAS

Western Kansas Wildcat Shows Oil in Mississippi

A NEW pool may be in prospect for southwest Trego County in western Kansas, with oil being bailed at the rate of 1 bbl. an hour from the Mississippi at the Republic Natural Gas Co. 1 Hille, SE SE SW 23-15-24w. Pipe was set on top of the Mississippi at 4,293 ft. and preparations are being made to acidize at that depth. The well was drilled to a total depth of 4,316 ft. and treated with acid. The Arnold pool in Ness County is 6 miles to the northeast of the wildcat.

Doley Oil Co. is attempting to extend production in the Ellis pool, Ellis County, 1 mile to the east with the 1 Shubert, SE SE SE 32-12-20w. Operators are drilling below 1,600 ft. The anhydrite was topped at 1,505 ft.

A rank wildcat test 5 miles south of the Nebraska line has been announced by Helmerich & Payne at the 1 Joen, SE SE SW 28-2-28w, Decatur County. Surface pipe was cemented at 158 ft. and operators are drilling below the surface pipe. The Adell pool is 24 miles northeast of the test.

Kansas reported 36 completions. Five wildcats were completed of which two made oil and three were dry. Of the 31 field wells completed, 17 made oil with a total initial production of 4,352 bbl. Five of the producers were completed in the Trapp field. Three wells made gas and the remainder were dry.

KANSAS SUCCESSFUL WILDCATS

Rush County: Darby & Bothwell 1 Wagner, NE NE NW 28-18-16w, pumped 21 bbl. from La Motte sand at 3,623-44 ft., TD 3,644 ft.

Stafford County: Cities Service Oil Co. 1 Kipp, NE NE NE 23-25-14w, flowed 1,260 bbl. of 32.2° gravity oil from Lansing-Kansas City lime at 3,844-63 ft., TD 4,303 ft.

KANSAS WILDCAT FAILURES

Barton County: Mid-Continent Oil Co. 1 Werhahn, NW NW NW 31-19-15w, dry at 3,812 ft., Arbuckle 3,686 ft.

Butler County: Beech Aircraft 1 Kirkpatrick, SE SW NE 14-28-3e, dry at 2,555 ft., Kansas City lime 2,285 ft.

Reno County: Cities Service Oil Co. 1 Johnson, NW NW NE 32-22-9w, dry at 3,750 ft., Viola 3,703 ft.

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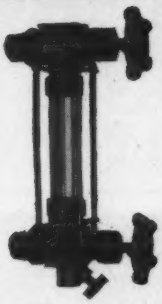

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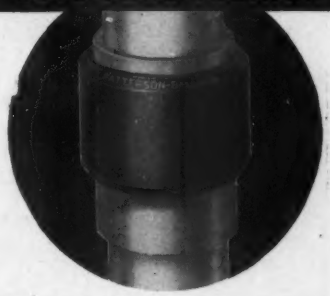

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CALIFORNIA

New Sand Discovery Extends North Coles Levee Field

LOS ANGELES.—Richfield Oil Corp. has extended the eastern limits of production in the North Coles Levee field of Kern County and at the same time has made a discovery of a new sand that should add several million barrels of recoverable oil to the field's total ultimate. The new sand which will be designated as the 25-33 sand will probably be limited to the south flank of the structure and more particularly to the easterly plunge of the anticline. This sand was found several weeks ago but its real significance was not realized until a second well had been completed and the sand found in a third well. The first completion in this horizon, which occurs between the upper Western zone and the lower Western zone, was 51-34 Kern County land, 34-30s-25e, brought in flowing 2,308 bbl. of clean pipe line oil and 2,250,000 cu. ft. of gas daily from 9,605 ft. with perforations at 9,310-605 ft. The second completion, finished this week, was 14-35 Kern County land, 35-30s-25e, which was completed flowing 1,041 bbl. of oil and 910,000 cu. ft. of gas per day from 9,756 ft. with perforations open at 9,538-9,756 ft. A third well, 45-34 Kern County land, 34-30s-25e, has just been completed at 9,640 ft. but an actual gage is not yet available.

J. Paul Getty who recently extended the eastern limits of the Mountain View field by completing an excellent flowing well in the northwest corner of Section 33-30s-29e has made location for an offset to be drilled in the northeast corner of Section 32-30s-29e. Production is expected around 5,400 ft. as the recently completed extension well, 11 Derby, was finished at 5,403 ft. and the 7-in. casing perforated above this point.

The Navy Department has successfully completed 44-24-Z, an extreme westerly outpost in the Hillcrest section of the Elk Hills anticline but production is being restricted to 350 bbl. daily through a 12/64-in. bean. This Stevens sand well proves up several additional locations outside the Naval Reserve. W. T. Woodward and American Placers, Inc., who are drilling a deep test a few miles south of Navy's 44-24-Z are making hole at 6,550 ft. but are not yet deep enough to encounter the Stevens sand of Miocene age.

Ohio Oil Co. is still having considerable difficulty making a formation test in its Gardena wildcat and will probably set a cement bridge to form the basis for setting the tester. The tester has failed to set on two previous attempts, the shoulder refusing to hold. This is the Ohio's second Gardena wildcat and while higher structurally than the first hole it remains to be seen whether the schist high has reduced the amount of oil sand present. The present test does not appear to have as much kick as the first test which leaves some doubt as to its possible ability to produce. Locations this week far exceeded completions due to multiple locations by Macoil at Newport, Jergins at Edison, Crestmont at Mount Poso and Belridge Oil Co. and Standard at South Belridge.

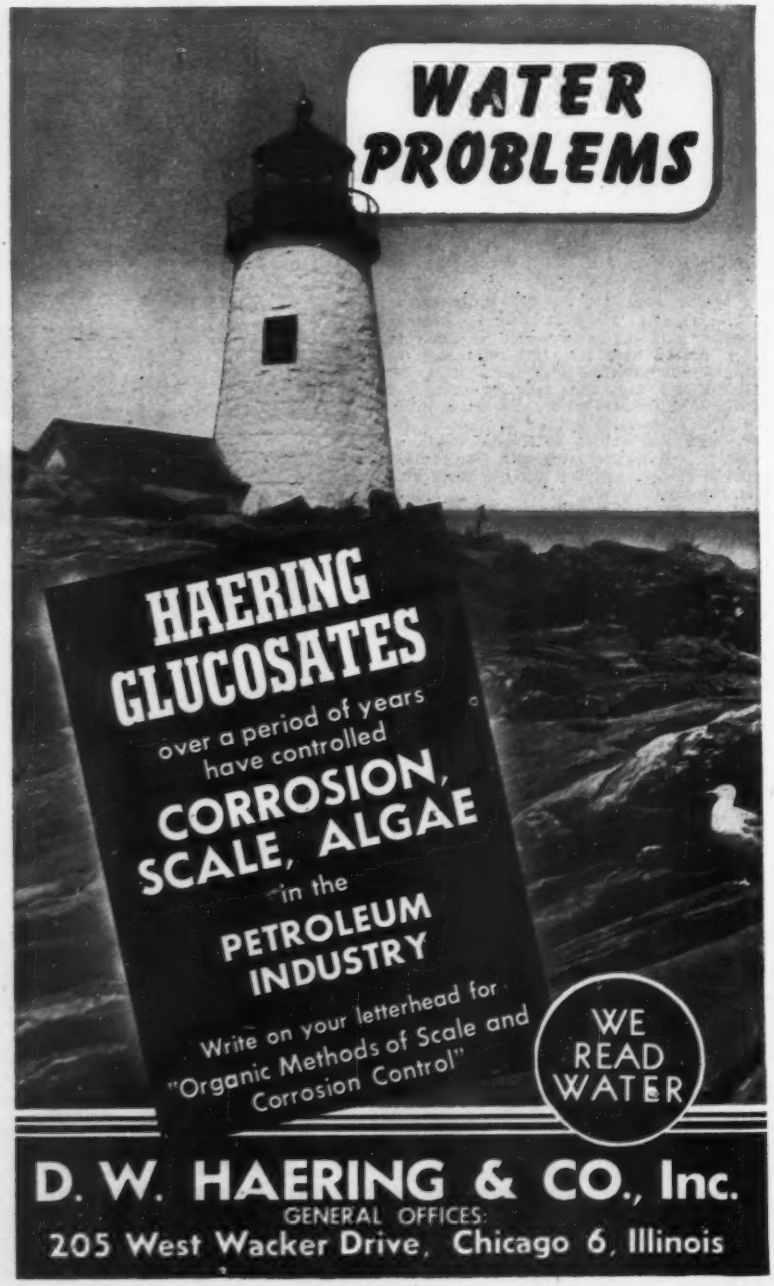
CALIFORNIA WILDCAT FAILURES

Kern County, Devils Den: Barnsdall 1 Bates, 20-25s-19e, bottomed in gray shale, oil sand 1,148-1,222 ft., could not produce, TD 1,276 ft., will drill second well.

San Emidio: Standard 24-32 Kern County Land, 30-11n-24w, bottomed in shale, form test 1,070-1,146 ft. recovered 756 ft. mud, form. test 1,660-1,850 ft. recovered gassy mud, no oil or gas, TD 1,850 ft.

Temblor: Beverly Trading Co. 1 W. P., 30-29s-21e, bottomed in gray shale, oil zone was negative on electric log, TD 2,040 ft.

Los Angeles County, Ramona: Kavanaugh & Wilhite 1 Ramona Hills, 8-4n-17w, bottomed in fault zone, vertical dips in bottom of hole, no showings, TD 2,026 ft.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MISSISSIPPI

To Perforate Deep Test In Adams County Field

JACKSON.—Casing has been set 1 ft. off bottom at 12,717 ft. and preparations made to perforate on the deepest test drilled in the Cranfield pool at the California Co. 9 Ella G. Lees, Section 45-7n-1w, Adams County. The Marine Tuscaloosa was topped at 9,770 ft., basal sand at 10,123 ft., Comanche at 10,225 ft. and the Paluxy at 11,396 ft.

Another producer has been added to the Gwinville field in Jefferson Davis County with the successful completion of the Gulf Refining Co. 1 Mullins-Griffith Unit, 660 ft. south and 750 ft. west of northeast corner of 34-9n-19w. Initial production was 698 bbl. of 39.8°-gravity oil in 24 hours through ¼-in. choke from perforations at 9,240-50 ft. in the Tuscaloosa horizon. The hole was drilled to a total depth of 9,377 ft. Perforations were made at 9,260-65 ft. and a drill-stem test recovered salt water and a small amount of oil. Perforations were squeezed. The "Mullins" sand was topped at 9,190-9,227 ft., Massive sand at 9,235 ft., and Comanche at 9,328 ft.

Mississippi reported no wildcat comple-

tions. Fayette field had two completions, one oil and one dry. Heidelberg field East and Pickens field each added an oil producer. A completion in Kings field was dry.

OHIO, KENTUCKY

New Gas Pool Opened In Ashland County

COLUMBUS.—Glen Harmon 1 E. C. Hauenstein, Section 9, opens up another new pool in the north part of Jackson Township, Ashland County. Clinton sand at 2,905-11 ft. gaged 1,430,000 cu. ft. natural. A south offset will be drilled.

B. G. Bartley 2 S. E. Varner, Section 7, Hopewell Township, Muskingum County, ½ mile west of the No. 1, came in at 750,000 cu. ft. natural with 1,040 lb. pressure.

The drilling around the city of Canton continues at a fast pace with from two to four completions a week. Thirty strings of tools are running in the area at present.

Nineteen locations were reported this week, distributed as follows: Cambridge six, Sandyville five, Ashland three, Lancaster two, Stewart and Brush Creek one each.

Twenty-one wells were completed with Cambridge in the lead with six.

OHIO SUCCESSFUL WILDCAT

Ashland County, Jackson Township: G. B. Harmon et al 1 E. C. Hauenstein, Section 9, Clinton 2,905-11 ft., 1,430,000 cu. ft., TD 2,912 ft.

WILDCAT FAILURES COMPLETED IN OHIO

Tuscarawas County, Jefferson Township: S. E. Dies 1 C. E. Schreiner, Sec. 21, Berea 972-1,038 ft., TD 1,038 ft.

WESTERN KENTUCKY

OWENSBORO.—Activity in the Western Kentucky area was relatively quiet during the past week with no wildcats reaching important stages of drilling. Six completions were reported, including four oil wells, one gas well and one dry hole. None of the completions were wildcats. Seven new operations were announced, three in Henderson County, two in Union, and one each in Crittenden and Daviess.

EASTERN KENTUCKY

ASHLAND.—Kentucky-West Virginia Gas Co. completed well No. 5617 on the Emily Thacker property, Pike County, total depth 1,978 ft., open flow 1,107,000 cu. ft. of gas in Maxon sand.

Kentucky-West Virginia also completed well No. 800 on the property of David Johnson, et al, Floyd County, total depth 3,295 ft., open flow, 440,000 cu. ft. in Big Lime and well No. 5629 on the Henry C. Wells property, Johnson County, total depth 2,406 ft., open flow of 119,000 cu. ft. in shale.

Kaiser Oil Co. completed well No. 2 on J. Meadows farm in Bath County, McCulley branch, total depth 219 ft. Although untested, the well is estimated good for 50 bbl. a day.

INDIANA

EVANSVILLE.—F. A. Calvert et al have apparently found a new oil pool in Posey County in their 1 Mary Gretageot, NE SW SE 24-5s-14w. Pipe has been set following a 65-minute drill-stem test of the Palestine sand at 2,004-22 ft., total depth, which recovered 1,800 ft. of clean oil and 120 ft. of oil-cut mud. The 1 Mary Gretageot is about ½ mile east of production in the south end of the Mink Island area of the New Harmony field.

F. J. Fleming & A. K. Swann are rigging up rotary at the 1 John Hartman, NW NW SE 27-6s-12w, Posey County. The 1 Hartman is a wildcat test about 2 miles southeast of production in the Crunk pool.

Indiana completions during the past week totaled four, of which three were oil wells with a total initial production of 275 bbl., and one was a dry hole. No wildcat completions were reported. New operations announced during the week included four tests in Posey County, two in Gibson, and one each in Pike and Sullivan.

LA.-ARK.

Running Casing at Franklin Parish Test

SHREVEPORT.—Casing is being run to the Paluxy, topped at 4,590 ft., at the H. L. Rowley and Big Chief Drilling Co. 1 Leo Rogers, SW NE 15-16n-9e, wildcat in Franklin Parish and 3 miles south of the Delhi field. The hole was drilled to a total depth of 4,682 ft.

Operators are perforating at 3,445-80 ft. at the Carter Oil Co. 1 Louisiana Long Leaf Lumber Co., SW SW 27-7n-10w, Sabine Parish. The well was bottomed at 9,216 ft. and plugged back to 3,500 ft. It is located on the southeast edge of the Zwolle field.

After perforations at 1,207-19 ft., the Charles F. Steele 1 H. L. Waters, N½ NW NE 20-14-21, wildcat in Nevada County, has been pumping an estimated 150 bbl. fluid a day of which approximately 30 bbl. was oil and the remainder water. With continued pumping, the oil production has decreased to 15 bbl. a day and the water increased. The well has been shut in and operators are waiting on orders.

The M. W. Martin and J. H. Coker 1 W. H. Stewart, 1,600 ft. south and 2,000 ft. east of NW cor. 3-3n-5, wildcat in Prairie

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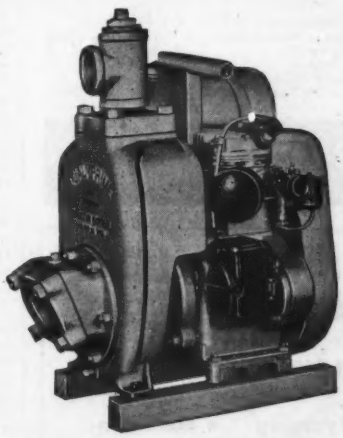

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County, was shut down after being drilled to a total depth of 3,134 ft. Operators are rigging up heavier machinery in order to test sands below 3,086 ft.

North Louisiana reported 12 completions of which 2 wildcats were dry. Of the 10 field wells completed, 7 made oil and 3 were dry.

Arkansas reported one completion, a wildcat failure in Ouachita County.

ARKANSAS WILDCAT FAILURE

Ouchita County: S. J. Felsenthal et al 1 H. H. Medlock, SE SW 29-15s-18w, dry at 3,504 ft.

NORTH LOUISIANA WILDCAT FAILURES

De Soto Parish: Arthur Brewer et al 1 H. S. Rogers, SW NE SE 32-13n-14w, dry at 3,025 ft.

Tensas Parish: Sohio Petroleum Co. 1 Biedenhorn, 660 ft. north and 660 ft. east of southwest corner in 11-12n-12e, dry at 8,927 ft.

OKLAHOMA

Oakwood Wildcat to Seek Pay in Wilcox Sand

SEVERAL of the key wildcats in the Anadarko Basin were drilling below 11,000 ft. at the end of the past week and several others were nearing that depth, with no new shows reported in any of the operations.

Operators of the Oklahoma Natural Gas Co. et al 1 Oakwood Unit, NW NW NW 6-17n-14w, rank wildcat in Dewey County, are convinced that the big production, if any, will be found in the Wilcox sand, and are asking owners of adjacent acreage who hold an interest in the test to participate in a new agreement which will permit the well to be drilled ahead to that horizon. The Wilcox is expected to be encountered about 1,000 to 1,100 ft. below the present depth of 9,600 ft. The last show was encountered at 9,476-9,500 ft. where a drillstem test showed 500,000 cu. ft. of dry gas.

Grady County's closely watched wildcat, the George P. Livermore 1 Giles Ranch, NW NW 35-8n-5w, southwest of Blanchard, is drilling ahead below 11,092 ft. in what is believed to be the Harragan zone of the Hunton. Operators are expected to begin coring soon in a search for the Chimney Hill section of the Hunton. The Hunton has shown gas at intervals during the course of drilling.

Magnolia 1 Britt Unit, SE NW SW 3-4n-6w, southeast of the Chitwood pool, has been completed for 5,368,000 cu. ft. of gas and 268 bbl. of 55.6° gravity distillate a day through perforations at 10,908-37 ft. and 10,959-93 ft. Gage was on a 16-hour test and for the first 8 hours' flow was through a ½-in. choke while during the last 8 hours it was through a 24/64-in. choke. The northwest outpost to the Chitwood pool, Magnolia 1 Spiers, SW SW 28-5n-6w, was last reported drilling ahead below 11,374 ft. A core was taken at 11,364-74 ft., recovering only dry shale.

Many major companies and independents have believed for several years that a good reservoir must exist somewhere among the intensely folded subsurface strata of Atoka County, and this theory is being revived with the announcement of a new test which is soon to start there. The test will be the A. G. Blauner 1 Blauner-Presson, SW NE NW 19-3s-11e, 3 miles southwest of Tushka in the south central part of the county.

OKLAHOMA SUCCESSFUL WILDCATS

Lincoln County: Sam A. King 1 Earlabough, SW SE NE 34-13n-5e, 117 bbl. from May at 4,297-4,303 ft., TD 4,303 ft.

OKLAHOMA WILDCAT FAILURES

Carter County: Continental Oil Co. 1 Bonner, SE SE SW 18-3s-2w, dry at 6,713 ft., Hunton 6,669 ft.

Garvin County: Schneider & Pennington 1 Kirkpatrick, SE SE NW 24-4n-3e, dry at 2,065 ft.

Logan County: Jordon Petroleum Co. 1 Webster, NW NW NW 13-15n-1w, dry at 5,930 ft., sand 5,857 ft.

Pontotoc County: Rocket Oil Co. 1 McClure, SW SE NW 10-4n-5e, dry at 2,737 ft., dolomite 2,270 ft.

Pottawatomie County: Atlantic 1 Stuart, SW SW SE 32-11n-3e, dry at 5,940 ft., second Wilcox 5,918 ft.

Stephens County: T. H. McCashland 1 McInnich, SE SE NE 18-1n-5w, dry at 3,748 ft., Hoxbar 3,535 ft.

Tillman County: Seitz, Comegys, Seitz 1 G. W. Bitner, NE NE SE 26-4s-16w, dry at 3,100 ft., base Permian and top of Asco 1,570 ft.

Rebuilding of Oil-Sand Plant in Canada Studied

EDMONTON, Alta.—Officials of Abasand Oils, Ltd., are planning to rebuild the Fort McMurray, Alta., oil-sand recovery pilot plant which was partially destroyed by fire last year, but definite plans are awaiting a decision on continued participation by the Canadian Government.

The Fort McMurray plant was operated for a number of years to test various methods of mining, separating, and refining oil from oil sands in an effort to evolve a commercially practicable process.

In the summer of 1945, the company was reported to have demonstrated that crude oil could be separated effectively from the sands, and all that remained was to establish costs under sustained capacity operation.

Two days before the final tests were to begin, however, a fire destroyed the separation plant and several shop buildings. After the fire, the Dominion Government of Canada, which had agreed with the company in 1943 to assume responsibility for financing the project, became undecided as to what extent it would continue its support. Pending this decision, the plant remains shut down.

The old plant had a capacity of 500 bbl. of crude daily. Present plans are to rebuild on the basis of either 500 or 1,000 bbl. daily.

At the recent annual meeting of the company, G. B. Webster, vice president and managing director, said, "Results had been obtained prior to the fire which would lead to belief that a process had been evolved which would economically extract the bitumen from the sand, but before it could be definitely stated that the process was successful, it would be necessary to conduct further tests over a prolonged period.

"With the increasing cost of oil in North America and the decrease in supply—as well as the increasing use of plastics in industry—it is thought that the day is not far distant when the bituminous sands of Northern Alberta will become an important source of supply for these products."

Pipe-Line Reclaimer Removes Pipe Without Use of Ditcher

The pipe-line reclaimer described in this article recently attracted considerable attention when used on a project undertaken by H. C. Price Co. This project was described in an article appearing on page 116 of the March 16, 1946, issue of The Oil and Gas Journal.

PIPE-LINE reclaimer is the name of a new unit which permits removal of pipe from a buried line without first uncovering it with a ditcher. Developed by K. C. Knapp, of Oxford, Kans., the new device has been tested on several occasions and results indicate that pipe can be removed much faster by this method than by usual practices, resulting in considerable savings.

The equipment, here illustrated, consists of two parallel blades sharpened on the leading edge and attached to a beveled shoe which is also sharpened on the leading edge. The point at which the blades are attached to the shoe is adjustable so that the downward pull of the shoe can be made to balance the lift of the cutting blades, thus eliminating any undue pressure on the pipe line. An elevator made of a section of oversize pipe is attached to the shoe and set at an angle to lift the pipe to the surface. The remaining piece of equipment is known as the cradle and is also made from a section of oversize pipe.

Operating principle of the reclaimer unit is to loosen the earth sufficiently to allow the pipe line to be elevated to the surface, leaving the soil in the ditch. The earth on the sides of the pipe line is cut by the parallel blades while that beneath the line is cut by the beveled shoe. Cutting edge of the beveled shoe is set to remain 1¼ in. or more beneath the pipe line, insuring a cushion of dirt between the line and the shoe at all times.

After the earth has been loosened above and around the pipe line, the elevator gradually lifts the line upward through the loosened soil. Angle and length of the elevator are governed by the size, condition, and flexibility of the pipe and the depth and type of soil covering. The cradle, supported by a side-boom tractor and pulled by a cable fastened to the upper forward ends of the cutting blades, is set at ground level at a distance behind the elevator which will maintain the same angle of rise begun by the elevator.

The entire device is pulled by a caterpillar-type tractor by means of a towline attached to the upper forward ends of the cutting blades. In some instances it is possible to pull the reclaimer equipment by means of a power winch mounted on the rear of a tractor, making it possible to recover pipe from areas of quicksand and gulleys which are impassable even for tractors.

Costs Materially Cut

Cost of building right-of-way for the reclaimer is much less than is usually spent, due to the fact that only sufficiently cleared space for the tractors to operate over the pipe line is needed. The reclaimer is thus very flexible and will function properly on types of right-of-way which are inaccessible to a ditching machine. In one instance, pipe was removed from a line which lay along a roadside within 1 to 3 ft. of hedge rows and fences, with insufficient space between the road ditch and hedge row for tractors to operate. In this case a long towline was used which permitted the tractors to work on the roadbed. The reclaimer conformed to the sidewise angle and operated as usual. At times the machine was actually working in a horizontal position removing pipe from the side of the bank.

The pipe-line reclaimer has also been tested successfully on extremely rough, rocky rights-of-way and on others where the soil was exceptionally boggy. Speeds of more than 1 m.p.h. have been attained, and in cases the cost of removal has been more than 30 per cent lower than the estimated cost for removal by usual methods.

BOOKS

ENCYCLOPEDIA OF HYDROCARBON COMPOUNDS. By J. E. Faraday. Chemical Publishing Co. Loose-leaf, in red buckram, $15.

Covering the data on hydrocarbons containing one to five carbon atoms, the author of this Volume 1 of the encyclopedia consulted 312 technical publications to collect the data included. The volume gives eight types of information on each compound; molecular and structural formulas; occurrence in nature and compound names; methods of preparation; physical constants and methods of detection and determination, and outstanding properties and reactions. Another useful inclusion is the Index of Trivial Names, giving colloquial and common names for various hydrocarbons, such as "Marsh Gas" for methane, "Pyrrolylene" for 1,3-butadiene.

For example, 145 methods for synthesizing or preparing isobutene are given, with very brief explanation of the reaction employed in each case, and literature references for each method. For lesser-known hydrocarbons often only one method of preparation is given. Methane can be prepared by 554 different methods, according to the encyclopedia. As a source book and bibliography of processes and properties, the volume will prove to be indispensable to the chemist and designing engineer as well as the operating engineer who must know his hydrocarbons.

CONFERENCE ON UNIFICATION OF ENGINEERING STANDARDS. Screw Threads, Pipe Threads, Limits and Fits, Drawing Practice and Metrology. Superintendent of Documents, U. S. Government Printing Office, Washington. 20 cents.

This is a report on the conference held at Ottawa, September 26-October 6, 1945. It records the achievements obtained to date, but covers more specifically the period since the London conference.

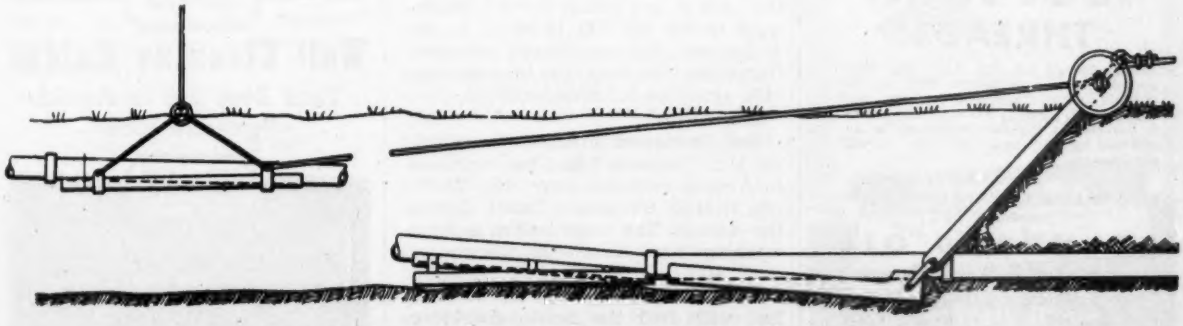

Fig. 1—New pipe-line reclaimer, and its principle of operation

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Among the

Drilling Contractors

J. W. Osteen Drilling Co. is drilling below 515 ft. at the A. S. Mims 1 Sheriff in NW 14-N-29, Daviess County, Kentucky.

Hurt-Scroggy Drilling Co. is drilling below 366 ft. at the H. L. Cokes 1 Mitchell heirs, 5 miles northwest of Edmonton in Metcalf County, Kentucky.

Lichlyter Drilling Co. is rigging up at the E. T. Wix and H. Ames 2 C. C. Colburn in SW NW NE 24-5n-7e, Clay County, Illinois.

Harlan Park Drilling Co. has been contracted to drill the Simon Lebow 6 Anson Eole in NW NW 7-7s-7w, Spencer County, Indiana.

Crain Drilling Co. is drilling below 2,822 ft. at the Sun Oil Co. et al 1 Mrs. Lee Little, 2,145 ft. south and 865 ft. east of the NW cor. 8-2n-4w, Copiah County, Mississippi.

Loffland Bros. Drilling Co. is rigging up at the Humble Oil & Refining Co. in SW SE 19-48s-30e, Sunniland field, Collier County, Florida.

Ray Ash Drilling Co. will drill the Joseph Minneci 1 Ida M. Votaw in NE NE 12-27n-5e, Wabash County, Indiana.

Kiowa Drilling Co. is drilling below 1,380 ft. at the Texas Co. 1 Fish in SW SW SW 16-19-12w, wildcat in Barton County, Kansas.

J. W. Carter, Henderson, Ky., has purchased the interest of his partner, J. G. Cantrell.

Mike Marrs Drilling Co. has spudded the Leon A. and Elliott Davis 1 Whitehead in NE NE SW 18-18-8e, in the Mannford district, Creek County, Oklahoma. The well is to be a Bartlesville sand test to around 3,000 ft.

Don Townsend, of Brown Geophysical Co., Calgary, Alta., has returned to Alberta with his crew after working in the Oklahoma fields during the winter. The organization is now working in northeastern Alberta.

Hillburn Drilling Co., of Houma, La., will drill the British-American Oil Producing Co. 1 A. M. Dupont Corp., wildcat test in the Lapeyrouse area of Terrebonne Parish, Louisiana, in 15-20s-18e. Projected depth is 12,000 ft.

Noble Drilling Co. has the contract to drill 2 Brady-State, a 10,000-ft. test at Bayou Perot, in 2-16s-23e, Jefferson Parish, Louisiana, for The California Co.

Josline Production Co. has been contracted to drill the Davis Bros. 1 Stewart in NE W½ SW 12-18-3e, Payne County, Oklahoma.

Crosby Drilling Co. has been awarded the contract to drill the Texas Co. 4 City of New Orleans in the Leeville field of LaFourche Parish, Louisiana, in SE SE 23-21s-22e. Scheduled depth is 13,500 ft.

Scribner & Bebee Drilling Co. has been contracted by W. R. Curry, independent operator in Oklahoma City, to drill the 1 Jones in NE SE SW 6-12n-10e, Okfuskee County, Oklahoma.

A. S. Hayes, who recently resigned as vice president of Loffland Bros. Drilling Co., and R. P. Sprague, former general superintendent for the same company, have organized Hayes & Sprague Drilling Co., Inc., and will maintain offices in Los Angeles. Doc

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WEB WILSON Oil Tools

W. W. WILSON BUILDING
HUNTINGTON PARK, CALIF.

Hayes is president of the new drilling company and Ray Sprague is vice president and treasurer. The first drilling job of this company is Seaboard Oil Co. 8-1 Mission Land in the Newhall district of Los Angeles Basin.

Big Chief Drilling Co. is rigging up at the Stanolind Oil & Gas Co. 1 Cooper in SW SW NW 23-13n-1e, Oklahoma County, Oklahoma.

Southern Six Drilling Co. holds the contract for a 6,500-ft., test at the E. W. Delbridge, Jr., 1 Margaret R. Leach et al in 11-6n-12w, wildcat in Sabine Parish, Louisiana.

J. J. Moran & J. W. Moran Drilling Co., Wichita, Falls, Tex., has the contract to drill Bennett & Sorrells 1 Sanders, an 8,000-ft. wildcat 11 miles northwest of San Angelo, Tom Green County, Texas.

James C. Collins Drilling Co. was awarded the contract to drill the Bridgeport Oil Co. "A" 1 L. L. Van Sickle in SE SE SW 33-10n-3e, Saginaw County, Michigan.

R. L. Mong Drilling Co. is the contractor drilling the 1 J. D. Whitaker in NW NW 23-3s-10e, Tishomingo County, Mississippi, for Levan & Akers.

Brunson Drilling Co. was the contractor at the Saco Oil and Crown Petroleum Co. 2 Krug "A" in NE NW 26-14s-14w, Russell County, Kansas.

Penrod Drilling Co. has been contracted to drill a 6,000-ft. test at the Placid Oil & Union Producing Co. 1 Owens-Odom in NE NW 21-23n-6w, wildcat in Claiborne Parish, Louisiana.

Rex & Morris Drilling Co. held the contract at the Stanley Buffington 1 Shriver in NW SE SE 3-26-4e, Butler County, Kansas. The well was drilled to a total depth of 2,848 ft.

Wixon Drilling Co. drilled two wells in Butler County, Kansas. The wells are the Henderson Oil Co. 28 Wilson in SW SW SE 7-25-5e, and the T. S. Dustin et al 2 Fowler in SE SW SE 1-26-4e.

General Petroleums, Calgary, Alta., has contracts for several additional wells this season to be drilled in the Vera-Unity area of western Saskatchewan. Verbata 2, in 24-41-24w3, is below 2,500 ft. and Bata 13, in 3-39-22w3, was noncommercial at 2,174 ft. Bata 14, LSD 14, 28-38-22w3, about 2 miles south of No. 13, is drilling. General Petroleums last year completed 10 wells in the East End field south of Unity, of which 8 were commercial, 3 ranging from 20,000,000 to 40,000,000 cu. ft. gas.

. . . but not when you are cementing casing in a well

That's one time to take every possible precaution, and the simplest, surest, low-cost method you can follow is to use Baker Casing Centralizers on the shoe joint, and on a joint or two above. The casing is centered in the hole so that cement slurry can get all around it, and you know the odds are with you to get a sound "first-time" cement job. Call any Baker man and he will see that you are supplied promptly with . . .

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PERSONALS

H. D. DALE

Dale Becomes Head Of Shell Plant at Wood River

H D. DALE, who recently returned from an inspection trip of both Germany and Japan as a petroleum manufacturing envoy with the Strategic Bombing Survey Mission, has been appointed manager of the Wood River refinery of Shell Oil Co., Inc., succeeding R. C. Roberts.

Dale has been associated with Shell continuously since 1924. With his new appointment, he returns to Wood River where he started his first job as tank gager upon his graduation from the University of Pittsburgh. During his first 8 years he progressed through various positions to head stillman, and in 1933 was named special technologist at the refinery.

In 1940 and 1941 he assisted in correlating the design and engineering of the extension of the plant and in the latter year was made superintendent. He was transferred to New York in 1944 as manager of the operations department and advanced to the position of assistant to the vice president of manufacturing.

Roberts is retiring after more than 29 years of service with Shell.

Charles O. Russell, president of Thermogas Co., Des Moines, Iowa, was named president of the Liquefied Petroleum Gas Association last week at the organization's first postwar convention in Colorado Springs, Colo. Chosen vice presidents were **L. V. Rothrock,** Twin Falls, Idaho; **Wendell B. Wright,** Albany, Ga.; **Tallant H. Ransome,** Emeryville, Calif.; **Foster V. Maybee,** Denver, and **Walter A. Maumer,** New York City. **Budd D. Geroy,** Chicago, was named treasurer, and **Arthur C. Kreutzer,** Chicago, secretary and assistant treasurer.

R. W. Stewart, recently returned from service in the armed forces, will resume his duties as district superintendent of the Luling district, Magnolia Pipe Line Co., at Luling, Tex.

R. E. Watson, vice president of Drilling & Exploration Co., Inc., Dallas, recently returned to his Dallas office after a 7-month absence in Venezuela. He will return to South America in the near future.

C. J. GARDNER

C. J. Gardner, assistant superintendent of Sinclair Refining Co.'s plant at Coffeyville, Kans., has been made superintendent of the plant with the retirement of **B. J. Healy.** Gardner has been with Sinclair nearly 28 years, working most of that time at the East Chicago, Ind., plant. Healy had been head of the Coffeyville plant 23 years prior to his retirement. **J. J. Connelly,** formerly at the East Chicago plant, was named assistant superintendent at Coffeyville.

Harry Brown has been appointed superintendent and **J. R. Penisten,** assistant superintendent of Frontier Refining Co. at Cheyenne, Wyo. Both formerly were with Universal Oil Products Co.

Robert E. Hardwicke, formerly chief counsel of Petroleum Administration for War, has returned to private law practice at Fort Worth, Tex.

Gage Lund, San Francisco, board chairman of the California Co.; **K. W. Crandall,** president; **J. W. Hoover** and **T. B. Flood,** vice presidents; **H. D. Collier,** board chairman, and **B. W. Letcher,** director, Standard Oil Co. of California, have made an extensive survey and inspection tour of the company's properties in the Rangely field, southeastern Colorado and Utah. The group met with local officials at Denver to discuss future exploration work in that area.

O. E. Gram, Wichita Falls, Tex., with Ohio Oil Co.'s geological department for the last 6 years, has resigned and has joined Union Production and United Gas Pipe Line Co. with headquarters at Wichita Falls.

D. E. Simic, Cities Service Oil Co., has been elected president of the North Texas Geological Society at Wichita Falls, Tex. Others elected were **L. L. Harden,** Sinclair Prairie Oil Co., vice president, and **Turner Wynn,** Stanolind Oil & Gas Co., secretary-treasurer.

Samuel B. Mosher, president of Signal Oil & Gas Co., **Edwin Pauley** and **Harold Pauley** of Petrol Co. and a group of other industrialists have purchased Coconut Island, a 16-acre island about 7 miles from Honolulu, and are planning to build an exclusive retreat for American business men.

E. W. Lounsbury, who served in the Army as a major in the Transportation Corps, and later worked with the War Shipping Administration in Washington, has opened an oil and tanker brokerage office in New York.

Elmer W. Ellsworth, formerly executive secretary of the Independent Oil Producers Association of Illinois and president of the Midwest Association of Consulting Geologists is returning to his consulting geological office in Centralia, Ill., after Army service. Ellsworth has been stationed in Tokyo as a lieutenant colonel in the natural resources section of the headquarters staff.

E. J. Burkhardt, aviation sales manager of Standard Oil Co. of Ohio, has been named chairman of the newly-formed aviation advisory committee of American Petroleum Industries Committee. **Aubrey Keif,** aviation sales manager of The Texas Co., was named vice chairman and A.P.I.C.'s **A. T. Hapke,** secretary. The new committee is slated to work with A.P.I.C.

on taxation and legislation affecting sales and distribution of aviation petroleum products.

P. C. Spencer, president of Canadian River Gas Co. and Southwestern Development Co., has been elected general counsel of Sinclair Oil Corp.

J. A. Padon, for the last 28 years resident manager of the Tulsa office for the accounting firm of Haskins & Sells, has been appointed assistant to the president of Warren Petroleum Corp. Padon will serve as a director and a vice president of the company in charge of financial affairs. He is the author of a number of articles on oil industry finance and accounting and is well known in oil circles.

T. C. Dauphine, former research engineer for California Research Corp., has been named eastern manager of product development for Oronite Chemical Co., a subsidiary of Standard Oil Co. of California.

Fred C. Platt has been named chief oil and gas supervisor of Montana by the members of the board of railway commissioners and the state Oil Conservation board. Headquarters will be at Billings. **H. E. Warner** was named assistant state oil and gas supervisor with offices at Shelby.

Joseph C. Alther, formerly vice president and director of Universal Oil Products, has resigned from the company after 30 years of service and established a consulting office in Chicago. His resignation was accepted by the board of directors in May 1945, but Alther agreed to remain available as a consultant to the company for 1 year which terminated May 31.

C. C. Bankhead, formerly senior exploration engineer for Shell Oil Co., Inc., at Kilgore, has been made senior area exploitation engineer at Houston. Other promotions and transfers in the Texas Gulf area of the company: **H. R. Burkhart,** mechanical engineer, transferred, Houston to White Castle; **T. S. Edrington,** senior seismologist, transferred, Houston to Midland; **R. M. Hippard,** junior exploitation engineer, transferred, Kilgore to Midland; **M. T. Johnson,** exploitation engineer, transferred, McCamey to Houston; **H. E. McDonald,** junior exploitation engineer, transferred, White Castle to Odessa; **O. L. Nuernberger,** Hobbs, N. M., district superintendent to production foreman; **J. P. Schmalz,** junior exploitation engineer, transferred, Houston to Black Bayou, and **J. W. Sutton,** district superintendent, Kilgore, to administrative assistant, industrial relations, and personnel, Houston.

John Dopler has returned to Interstate Oil Pipe Line Co. as a junior engineer at Wilson, Okla., following his release from the Navy.

M. O. Dickenson, Cox & Hamon, has been elected president of the Petroleum Accountants Society of Dallas. Other officers are **Myrle Webb,** Seaboard Oil Co., vice president; **J. H. Morris,** Buffalo Oil Co., treasurer, and **Arthur S. Jones,** Ryan Consolidated Petroleum Corp., secretary.

R. Elmo Thompson, for 7 years executive vice president of Sunray Oil Co., has resigned his position to become vice president of the First National Bank & Trust Co. in Tulsa. He assumed the new banking position on June 1.

Carl T. Humphrey, engineer at Cities Service Oil Co. refinery at Ponca City, Okla., has been elected president of the Ponca City Engineers' Club. He succeeds **T. Houston George.** Other officers named are **P. J. Ruckel,** vice president; **Byron Vorheis,** secretary; **Norman K. Edwards,** treasurer; and **Chandler Smith,** reelected program chairman.

Sterling W. Mudge, supervisor of training for Socony-Vacuum Oil Co., Inc., recently returned to New York from London where he discussed training methods with officials of Vacuum Oil, Ltd. He also addressed various management groups in London, including the newly organized Foremen's Association.

Ward C. Bean, senior geologist in the Mid-Continent area for Shell Oil Co., Inc., has retired after 23 years of service with the company.

Charles Haas has been appointed foreman in charge of the grease plant of Baltimore refinery of Standard Oil Co. (New Jersey).

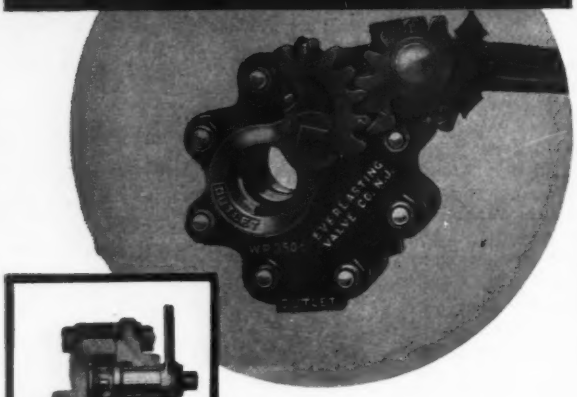
E. J. Miller has been appointed construction superintendent for McVean & Roberts, pipe-line contractors of Rodessa and Fort Worth, Tex. Miller, whose headquarters will be Rodessa, is an oldtimer in the pipe-line business, having started as a welder with Stanolind Pipe Line Co. in 1926. He was supervisor of pipe lines, in charge of maintenance and construction work with Stanolind until his recent resignation.

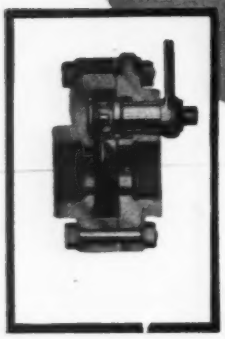
Thomas I. St. John and **George F. Sieg,** who have been laboratory assistants at Shell Development Co.'s Emeryville, Calif., plant, have been advanced to senior laboratory assistants.

Roscoe A. Cattell, chief of the Petroleum and Natural Gas Division of the Bureau of Mines, has received a commendation award and $1,000 from the Department of the Interior for his discovery of the use of helium as a tracer gas to determine underground movements of gas and oil. **Ellis M. Frost, Jr.,** Amarillo, Tex., won an award of excellence and $1,000 for improved apparatus and procedure for determining helium in natural gas.

W. Norton Grubb, area adviser for northern Europe, Standard Oil Co. (New Jersey) has been conferring with four Scandinavian representatives of Jersey affiliates in New York City. Shown here are Grubb; Frithjof Lind, Norway, board chairman and managing director of Ostlandske Petroleumscompagni; Ernst Muller, board chairman, and Norbey Nielson, Denmark, Det Danske Petroleums Aktieselskab; and Eigil Bonnelyche, Sweden, board member of Svenska Petroleum Aktiebolaget Standard. Grubb was recently released from the Navy in which he served three years as a commodore in the European theater

WHY DRILLERS PREFER this BLOW-OFF VALVE





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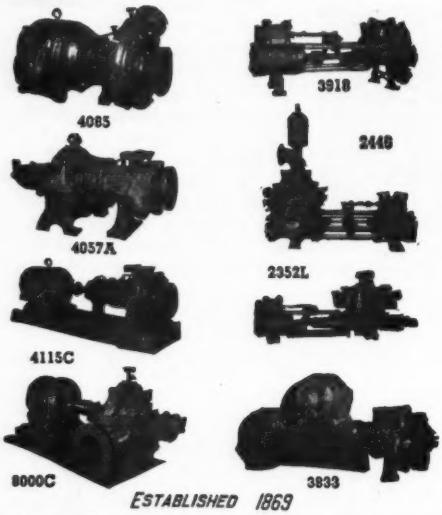

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Be sure to read the article in this issue (page 97) on new efficiencies of small fluid cat crackers.

Equipment Men in the News

Young Radiator Names Four Sales Engineers

The addition of four new sales engineers has been announced by Young Radiator Co., Racine, Wis. W. H. Schmeling, a graduate of Marquette University, is active in the

W. H. SCHMELING

A. D. BOGUS

solution of special radiator cooling problems. Also a graduate of Marquette University A. D. Bogus is specializing in the

E. C. UECKER

M. H. CANHAM

petroleum field and engine-jacket water-cooler heat-transfer engineering service. Edward C. Uecker, formerly with General Electric Co., is devoting his efforts to the specialized field of aircraft heat-transfer problems including lube-oil cooling, supercharger intercooling and aftercooling, gas-turbine regenerator cycle cooling, etc. Uecker is a graduate of the University of Wisconsin.

M. H. Canham is serving the heating, cooling, and air-conditioning division.

Flemming Joins Larkin Company

Virgil Flemming, Tulsa, oil-field-equipment engineer, has been appointed sales representative for Larkin Packer Co., Inc., St. Louis. His sales territory will include Tulsa, Bartlesville, Ponca City, Fort Worth, and Dallas.

Flemming replaces S. M. "Puny" Blevens, who resigned recently to accept the positions of vice president and sales manager for C. W. Cotton Supply Co.

Turco Appoints Yeck

Appointment of Robert K. Yeck as technical service representative for the State of New Mexico is announced by Turco Products, Inc., 6135 South Central Avenue, Los Angeles. Offices and warehouse facilities have been established in Albuquerque at 200 Korber Building.

Rheem Taps Mexican Market

Inexpensive water heaters and space heaters for the mass Mexican market to burn kerosene and butane are among products Rheem Manufacturing Co. will make in that country in cooperation with Mexican associates, R. S. Rheem, president, announces.

A new company, to be known as Rheem de Mexico, S.A., is in process of formation and will start construction of a factory this month at Tlalnepantla, an industrial suburb of Mexico City.

Regan Appoints Hunt Export Distributors

Regan Forge & Engineering Co. has announced the appointment of Hunt Export Co. as export distributors for its products.

Formed in April 1945, Hunt Export Co. represents Hunt Tool Co. and a number of other manufacturers of oil-industry equipment in countries outside the United States.

Urban Appointed by U. S. Rubber

Frank M. Urban has been appointed merchandise manager of the mechanical goods division of United States Rubber Co., according to Walter F. Spoerl, general manager of the division.

Firm Changes Name

The Busch-Baldwin Co. has changed its name to The Baldwin Co. and will be owned and operated by L. Keith Baldwin, in Houston. The company continues to represent Scovill Manufacturing Co. and Detroit Seamless Steel Tubes Co. for a complete line of ferrous, nonferrous, or bimetal seamless heat exchanger and condenser tubes.

Wiegand Named General Attorney for Oil Well Supply

F. L. WIEGAND, JR.

Appointment of Frank L. Wiegand, Jr., as general attorney of Oil Well Supply Co., U. S. Steel Corp. subsidiary, is announced by Fred F. Murray, president. Wiegand will hold this office in addition to his present responsibility as secretary of the company.

Dershimer With Pittsburgh Steel

H. S. Dershimer has been made assistant sales manager, Mid-Continent district, for Pittsburgh Steel Co., Pittsburgh. His offices are in Tulsa. Dershimer was with National Tube Co., Ellwood City, Pa., in purchasing capacities 1922 to 1926, was purchasing agent for Guaranty Liquid Measure Co., Rochester, Pa., 1926 to 1929, and since 1929 has been in production and sales capacities for Babcock & Wilcox Tube Co., Beaver Falls, Pa., for the past 10 years its district sales manager at Tulsa.

Hickman Back With Jackson

Jesse E. Hickman has joined the sales staff of the New York office of Byron Jackson Co., Oil Tool Division. Hickman, who has been with Byron Jackson Co. for 7 years, returned from the Navy in January and spent 2 months in the fields of the Gulf Coast and California before coming to New York.

New Assistant District Manager

H. Cubbie Roane has been named assistant district manager of the Atlanta office of Bowser, Inc., it is announced by Fred S. Ehrman, Bowser general sales manager. Roane's territory includes North and South Carolina, Georgia, Florida, Alabama, Mississippi, and eastern Tennessee.

Bannerman to Travel Abroad for Totco

In order to improve the company's service to operators in foreign fields, Technical Oil Tool Corp., Ltd., has sent P. T. Bannerman, a laboratory and field-trained sales and service engineer, on a 6-month trip to South America.

Bannerman is now in Colombia, and will proceed down the east coast of South America to Argentina, returning by way of the west coast to Mexico where he will cover the Mexican oil areas before returning to the United States.

Upon the completion of his South American trip Bannerman will journey to oil areas in the Near East, India, and the Netherlands East Indies, extending this new service of the Technical Oil Tool Corp., Ltd., to operators in those areas.

Richie Photographing in Middle East

Robert Yarnall Richie flew to Saudi Arabia recently where he is presently doing Kodachrome motion pictures and a series of still photographs on the Arabs and Arabian petroleum activities. He will return to New York some time in June.

Alco Appoints Dudley

Appointment of Edward J. Dudley as public relations representative of American Locomotive Co. at Schenectady has been announced by Lynn Mahan, assistant to the president in charge of public relations.

New Manhattan Distributor

Appointment of The Republic Supply Co. of California as distributor of Manhattan industrial rubber products, has been announced by Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.

Republic Supply will be under the supervision of A. R. Bradshaw, Manhattan's Pacific Slope manager at San Francisco, and R. G. Hueman, Manhattan factory representative, will make his headquarters at Republic.

Name Export Representative

Houston Oil Field Material Co., Inc., announces the appointment of E. F. Gahan, 500 Fifth Avenue, New York, as export representative.

Baker Announces Promotions

R. C. GLOVER

R. C. (Bob) Glover, district manager for Baker Oil Tools, Inc., at Olney, Ill., since 1938, has been appointed Tulsa district manager.

His wide experience throughout the Mid-Continent and eastern fields both as to rotary and cable tool drilling practices, and his knowledge of the use and application of the entire line of Baker products, fit him for his new assignment.

E. J. (Jay) Whitney of Houston, has been

transferred to Olney as district sales engineer to succeed Glover.

Roosa Heads Sales for Manzel Brothers Co.

H. H. ROOSA

Appointment of Herbert H. Roosa as sales manager of Manzel Brothers Co., Buffalo, is announced today by Ralph F. Peo, president. Roosa for the past 10 years has been associated with the sales department of Niagara Machine & Tool Works. He studied engineering at Antioch College and at the University of Michigan.

Celanese Corp. Names Bludworth Petroleum Research Head

Celanese Corp. of America has announced appointment of Joseph E. Bludworth as director of petroleum chemicals research and development. He will assume active direction of research on petroleum chemicals and development pertaining to the processes being carried out at the Celanese Texas plant, and research and development programs pertaining to other petroleum chemicals.

Davey Names Distributor For Southern Texas

Appointment of H. W. Lewis Equipment Co., San Antonio, as distributors for southern Texas, is announced by Paul H. Davey, president, Davey Compressor Co.

The Lewis company will handle the complete Davey equipment line including portable and stationary compressors, Auto-Air and Track-Air units, truck power take-offs, portable lighting units and power timber saws. Complete parts and service facilities will be provided.

Schmidt Rejoins Totco

Robert (Bob) Schmidt, recently returned to the company from 3 years in the U. S. Navy, has been assigned to cover the Rocky Mountain area for Technical Oil Tool Corp., Ltd. He will be in charge of sales and field engineering service of Totco recorders for controlled vertical drilling, with headquarters at Casper, Wyo.

Rubac Joined American Iron & Machine Works

Elmer E. Rubac, who has recently been released from the Army, has rejoined the sales department of American Iron & Machine Works, Oklahoma City. He succeeded W. R. Wheeler, who resigned to accept a position as manager of M-C-M Machine Works, of Oklahoma City.

Asp Rejoins Filtrol

Maj. Stanley Asp, Corps of Engineers, has just returned to his former duties with the research division of Filtrol Corp., Los Angeles.

Koepke Transfers Headquarters

Boyd F. Koepke, Aluminum Ore Co., has transferred his headquarters from East St. Louis to Dallas. Koepke will be in direct contact with the oil and gas industry in the Southwest and elsewhere in the interests of his company.

Union Tank Car Elects

L. J. Drake has been elected chairman of the board of Union Tank Car Co., after serving as president since 1926. B. C. Graves has been elected president. Graves has been associated with the company since 1903. J. E. Harley was elected a vice president. A. E. Gebhardt and R. H. Lamberton were appointed assistants to the president. All other officers were reelected.

Rosse Appointed Export Manager

M. R. ROSSE

E. P. Holder, president, announces appointment of Matthew R. Rosse as export manager for Colorado Fuel & Iron Corp., including all divisions and subsidiaries. Rosse has been export manager of Wickwire Spencer Steel, a division of the Colorado Fuel & Iron Corp. since 1943. Previously he was associated with American Chain & Cable.

Nofsinger Joins Stratford

Charles W. Nofsinger, formerly of M. W. Kellogg Co., is now associated with Stratford Engineering Corp., Kansas City, Mo., an an engineering consultant.

Demarest Joins Fluor Corp.

Kenneth D. Demarest, formerly with Griscom-Russell Co., has been appointed district engineer of Fluor Corp., Ltd., in its New York headquarters. Demarest's work for the past 15 years has been in connection with the oil, gas, and chemical industries. His duties have taken him over most of the United States and as far as Venezuela.

Bethlehem Supply Co. Appoints Fred Parks

FRED PARKS

R. G. Ayers, general manager of sales, Bethlehem Supply Co., has announced the appointment of Fred Parks as resident manager at Houston. Parks joined Bethlehem in 1939 as city salesman at Houston. He has since held the position of resident manager at Dallas, district manager of the Ark-La-Tex district with headquarters at Dallas, and on January 1, 1946, was appointed assistant to division managers, retaining his headquarters at Dallas. Parks will succeed T. R. Miller who has resigned.

National Radiator Purchases Plant

The National Radiator Co. has purchased the Pullman-Standard Car Co. plant at Middletown, Pa. The plant will fabricate steel boilers for industrial and domestic purposes, pressure vessels, heat exchangers and other industrial products, formerly made at the firm's Lebanon plant.

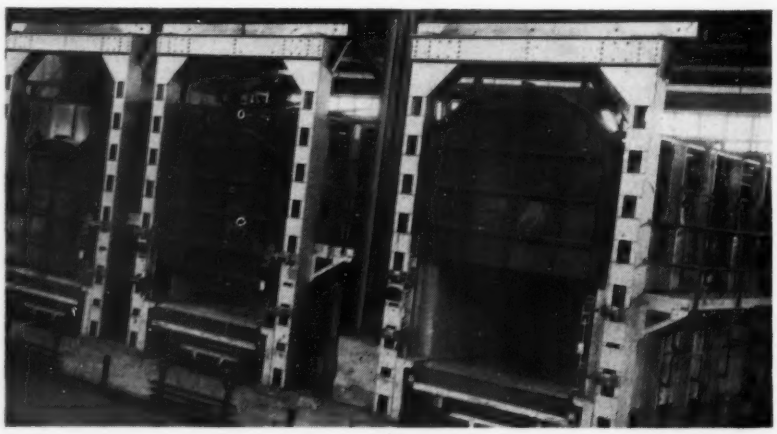
Middleton Joins Onan & Sons

R. L. "Tony" Middleton, specialist in oil-field equipment, has joined the D. W. Onan & Sons sales staff as factory representative. He will headquarter at Dallas. Before assuming his new duties Middleton completed an intensive study of Onan electric power plants and their application to oil-field requirements. He has had over 20 years' experience in engineering and selling equipment for oil-field applications.

HEAT-TREATING SERVICES AVAILABLE

Facilities of one of the largest and most completely equipped heat-treating and stress-relieving departments in the South are now available by Texas Electric Steel Casting Co., Houston, to manufacturers in the Gulf Coast area.

Furnaces throughout the new heat-treating department are designed to register temperatures from 200°-2,000° F. All furnaces are equipped with automatic recording pyrometers, to hold temperatures to ±10° F. The department covers more than 15,000 sq. ft. of space. Along one wall of the heat-treating department are 11 recirculating vertical-type hardening and draw furnaces. A liquid quench tank is located in the middle of the bank of vertical furnaces.

Three gas-fired car-type furnaces are provided for larger pieces. The department is so arranged that a truck can drive up to the car-type furnaces and unload equipment. A railroad siding adjoins the plant.

The car-type furnaces have an 8-ft. clearance under the door. They are 9 ft. wide and 25 ft. long. The vertical furnaces are 9 ft. deep with a 6-ft. inside diameter.